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Canal and River Engineering.

THE issue of a third edition of Mr. David Stevenson's valuable treatise* on this subject appears at an opportune moment, and confers additional significance, if such were wanting, on the fact that the attention of the British public is at length seriously aroused to the necessity of re-establishing on an effective footing the existing system of water transport throughout the United Kingdom. The trading community are at present so heavily handicapped by the action of the railway companies in the unduly preferential rates given to foreign produce and manufactures, and by the great pressure which the railway interest brings to bear on the Legislature to uphold that action, that their only remedy lies in persistent and united efforts not only in insisting on modifications of existing tariffs, but in following the example of Continental countries in re-establishing a thoroughly efficient system of water lines which shall be worked on equitable and economical principles. Every agency, therefore, that will help towards a practical attainment of that end is to be welcomed.

Mr. Stevenson's book may be shortly defined as a treatise on Inland Navigation. Its scope is not confined to a description of artificial waterways only, but embraces every portion of the subject, from the simple barge canal to the great natural highways of rivers, ranging from their estuaries, through their tidal compartments, up to the highest navigable points in their courses. The chapters devoted to the treatment of the sea and tidal compartment, to the laws of tidal propagation and tidal currents, to the formation and removal of bars, works for the accommodation of vessels, and the reclamation and protection of land, teem with valuable information, the importance of which is enhanced by its being the outcome of close personal observations and recorded facts, on both which rests the basis of his treatment of the several problems discussed.

The heads under which Mr. Stevenson has divided his subjects are:—

1. Barge and Ship Canals.
2. Rivers, subdivided into (*a*) the "River Proper" Compartment; (*b*) the Tidal Compartment; (*c*) the "Sea Proper" Compartment.
3. Works for the Accommodation of Vessels.
4. The Reclamation and Protection of Land; and
5. A few Remarks on the Crossing of Navigations by Bridges.

Though the main contents of this treatise have previously passed under review, yet it may not be amiss to revert again to a few of the more prominent questions discussed, especially in the light of the additional experience gained since the work was first written. The following remarks, made in the opening chapter, are especially timely, in serving to correct the erroneous impression which more or less still prevails as to the real extent to which canals are used at the present day. "Though all efforts to improve barge canals can never bring them to compete with railways in the quick conveyance of passengers, yet it is surprising to find in how many places they still command an enormous traffic in goods and minerals, and thus act as a valuable relief to over-burdened railways. This is especially the case in the manufacturing districts of England, where the Birmingham, Grand Junction, and other canals seem to carry on as brisk a trade as they did in days gone by, when they had no better competitors than the stage coach and the carrier's van."

The annexed table of the average freight per ton of wheat from Chicago to New York by water only, by water and rail combined, and by rail only, shows an advantage of 50 per cent. in favour of water conveyance:—

Year.	By Lake and Canal.	By Lake and Rail.	By all Rail.
	Cents.	Cents.	Cents.
1881	8·19	10·4	14·4
1882	7·89	10·9	14·6
1883	8·40	11·5	16·5
1884 Jan. to Sept.	6·60	9·75	13·0

In Belgium, the relative charge on canals worked by steam and on railways, is stated to be ·284 and ·483 of 1d. per ton per mile, or again nearly one-half less in the canal's favour. In describing the Languedoc Canal, with its hundred locks and fifty aqueducts, and its course of 148 miles carried over a summit level of 600 ft. above the sea, Mr. Stevenson observes, "It seems strange that Britain should not, till nearly a century after its completion in 1681, have engaged in vigorously following so laudable an example"; but, it is stranger still that a maritime nation should, after a lapse of two centuries, and with its prosperity built up by and mainly dependent on external water transport, and after having in olden days constructed some 4,700 miles of inland waterways, be still asleep to the necessity of remodelling and perfecting those waterways so as to adapt them to the exigencies of the present day.

One of the difficulties besetting canal engineering has always been the delay occasioned in overcoming differences of level, and various expedients have from time to time been devised to meet that difficulty. It has never been explained why the inclined-plane system, as modified on the Monkland Canal, where the boats are not wholly grounded on the carriage, but are transported over the incline in a caisson holding 2 ft. of water, and so are water-borne, has not been more extensively substituted for the ordinary locks; for it is far more quickly worked, a lift of nearly 100 ft. being accomplished in about ten minutes, which is quicker even than by the apparatus on the Weaver Navigation, where about 50 ft. of elevation is provided for by a single hydraulic lift of ingenious though expensive design, its cost having been 50,000*l.*, or at the rate of 1,000*l.* per foot of lift. It is the principle of the inclined plane that Mr. James B. Eads has adopted for his projected Ship Railway across the Isthmus of Tehuantepec, in Mexico, where an elevation of 726 ft. above mean sea level has to be overcome, the steepest gradient being 1 in 100 and the total length 134 miles. Very strong objections have been urged by nautical men against Mr. Eads's proposal, but were the plan of floatation, in part or in whole, combined with the design, possibly those objections would be met. Another modification necessary to meet the special requirements of the present day is the substitution of steam haulage for that of horse or manual power. It is true that the improvement has been already introduced on several canals, but its full advantage and economy cannot be reaped so long as the canals themselves have not been remodelled for the passage of steamers. Where they have been so, as on the Aire and Calder Canal, for instance, the cost of transport, as stated in evidence before the Canals Committee, has been reduced to so exceedingly low a figure as one-thirtieth of a penny per ton mile. It is to be wished that while endorsing the great advantages of employing steam traction, the practical part of this question had been more fully treated by the reviser, and particulars afforded of the resistance of vessels from piling and friction at different speeds, of the relative advantages of steamers for hauling or for carrying cargo, and of the relative cost of the different modes of steam traction in this and other countries. It would have added, too, to the value of the treatise had some of the evidence given before the Canals Committee on these points been embodied in it.

In discussing ship canals, the author justly observes that the statement of railways having

* The Principles and Practice of Canal and River Engineering. By David Stevenson, F.R.S.E., &c. Revised by his Son. Third edition. Edinburgh: Adam & Charles Black. 1886.

so far superseded canals is not applicable to these large works, but that ship canals retain all their usefulness, while the Suez and New Amsterdam Canals have acquired an importance before unclaimed for works of this class. The effect of the Suez Canal in reducing the freights formerly charged by the Cape route, as evidenced in the following table, has not, perhaps, been fully recognised by the general public :—

Comparison of Rates of Freight by Suez Canal and Cape of Good Hope.

Calcutta to United Kingdom.	Article.	1881.	1882.	1883.	1884.
		s. d.	s. d.	s. d.	s. d.
Viâ Cape	Jute	65 0	45 0	37 6	30 0
,, Canal	Jute	85 0	37 6	35 0	31 3
,, Cape	Wheat ...	62 6	33 0	25 0	20 0
,, Canal	Wheat ...	71 6	35 0	26 3	17 6
,, Cape	Linseed..	67 6	45 0	37 6	30 0
,, Canal	Linseed..	—	37 6	35 0	31 0
,, Cape	Rapeseed	70 0	47 6	37 6	30 0
,, Canal	Rapeseed	35 0	40 0	37 6	32 6

Ship canals are divided by Mr. Stevenson into four classes, of each of which he gives an example.

First. Canals traversing high districts, and surmounting the elevation by locks supplied from lakes and reservoirs, such as the Languedoc and Caledonian canals.

Second. Canals in low-lying districts carried on a uniform water level from end to end, like those in Holland, but defended by locks from inroads of the sea.

Third. Open canals, like the Suez, communicating freely with the sea at each end ; and

Fourth. Dredged canals through estuaries or maritime canals, such as the Clyde below Port Glasgow, the St. Petersburg Canal, and the Lough Foyle Navigation.

Plates illustrative of each of these classes of works are given, as also particulars of their cost, from which it appears that the Caledonian Canal, sixty miles in length from end to end, and overcoming an ascent of 102 ft., cost 1,000,000*l*., or at the rate of 16,666*l*. per mile: the Amsterdam Canal, 16½ miles long, but of very much larger sectional area and depth, cost nearly 3,000,000*l*., or about 180,000*l*. per mile: the Suez Canal, 100 miles long, and 26 ft. deep, cost 20,000,000*l*., or 200,000*l*. per mile: and the St. Petersburg Canal, 18 miles long, 275 ft. at base, and 22 ft. deep, which allows ships to pass direct to that capital, will, it is supposed, have cost 1,500,000*l*., or at the rate of 83,333*l*. per mile.

Other ship canals are mentioned, such as the Panama and the Corinth Canal. The construction of the first of these two projects is now being watched with much interest, as a work of immense magnitude, and one involving considerable engineering difficulties, the surmounting of which can only be accomplished at a very heavy outlay. Mr. Stevenson states the estimated probable cost at 30,000,000*l*., but if recent reports are to be trusted, the outlay is more likely to reach double that sum. An important point to be noted in connexion with these enormous undertakings is, in most instances, their remunerative character notwithstanding their great initial mileage cost. One other project is mentioned which, when carried out, will be scarcely second in usefulness to any yet executed, viz., that of making the Paumben Straits, which separate the island of Ceylon from the mainland, navigable for the largest ships passing through the Suez Canal. This work which, it is believed, was advocated fifty years ago by Sir Arthur Cotton was in later years, under instructions by the Indian Government, inspected by Mr. G. Robertson, of Edinburgh, who selected a line where the distance from sea to sea is only two miles, and the ground a flat sandy plain, raised on an average about 7 ft. above high water, and where, judging from the borings that have been made, but little rock is expected to be met with. The cost has been estimated at 440,000*l*., and as the canal will save 350 miles of exposed navigation in the direct Suez route to Calcutta and Madras, its execution can scarcely be long delayed.

In the chapter devoted to hydrometric observations, many curious and interesting anomalies in river tides are explained ; amongst others, that which occurs in the Amazon, where the tide is said to extend against the stream for several days, and to penetrate to the distance of 200 leagues from its mouth, and where seven or eight tides with intermediate low waters follow each other in succession. A similar phenomenon occurs in the Thames on a small scale, the cause of which was explained by Dr. Whewell to arise "from the peculiar circumstance of the rivers having a tide compounded of two tides arriving by different roads after journeys of different lengths," in allusion to the two branches into which the tidal wave is divided on reaching the British shores, one of which flows up the English Channel, while the other proceeds along the west and northern coast of the country, and, flowing down the east coast, again joins the other branch.

The diagrams, compiled from several series of careful observations, showing the slope of the surface during flood and ebb on different rivers, and the degrees of parallelism at different stages of the tide, are very instructive, leading to the conclusion that "the deviation in parallelism decreases in proportion to the decrease in the rise of tide."

In treating of the discharge of rivers, and the modes and instruments employed in measuring it, the author gives the preference to the current meter. That instrument, however, has not been found to succeed so well in large rivers, like those in America and India ; in fact, where great depths have to be gauged, its manipulation in a strong stream is very difficult, and in rivers charged with large quantities of silt in suspension, the action of the vanes is apt to be impeded. Notwithstanding the objections urged against float observations, engineers who have been employed in gauging the discharge of rivers of great magnitude have preferred the method used by Messrs. Humphreys & Abbott on the Mississippi, as well as their formula deduced therefrom ; at the same time, it is quite true that that formula is by no means generally applicable. Mr. Stevenson's remarks as to the floods of rivers bearing no constant ratio either to the summer water which they discharge or to the area drained by them are correct ; but it is doubtful how far his statement that "the only general result to be gathered from published observations perhaps being, that the flood discharge has a higher ratio to the ordinary discharge in small rather than in large rivers," is applicable to the rivers in South India, the summer volume even of large rivers there being often scarcely appreciable.

Chapter VI. is devoted to the consideration of the first of the divisions into which the author has divided the subject of rivers, and is occupied chiefly with a description of the Mississippi as given in Mr. Ellet's well-known report. One feature connected with its floods, that of the "peculiarly warped" form assumed by the surface from side to side and point to point, Mr. Stevenson thinks may be accounted for on the principle of "conservation of energy." The term "warped form" seems to be used to indicate the difference of level in the surface during flood observable on either bank ; but probably the centrifugal action generated by the curves more or less found on every river of magnitude would produce an elevation alternately on either bank. There is, however, another curious phenomenon which is not noticed by Mr. Stevenson, and that is the varying transverse form assumed by the surface of rivers during the rise and fall of floods, a form which is quite apparent to the eye of a practised observer, and that is, the convexity of surface in rising, and concavity in falling floods,—phenomena all the more observable in proportion to the rapidity with which the flood may rise or fall.

Not the least valuable part of this treatise is that which deals with the phenomena of tidal propagation and currents, the explanations regarding which, based on many long and carefully-conducted observations, and illustrated by very clear diagrams, are given with great lucidity ; and though experts may differ as to the treatment recommended for tidal rivers, yet it is difficult to see how any difference of opinion can arise, and how any one can fail to realise the masterly way in which the subject is handled by the author.

In connexion with the improvements in the tidal compartments of rivers, some interesting data are given as to the cost of dredging. The impetus which the excavation of the Suez Canal gave to dredgers called forth the ingenuity of manufacturers, so that the effectiveness of those machines has been greatly increased, while the cost of excavation by their means has been simultaneously much reduced. The work performed on the river Clyde has perhaps been the most successful in this country. It appears that in the years 1882-83-84, 1,220,752 cubic yards were dredged from the river, and carried to Lock Long by steam hopper barges, and deposited there at a total inclusive cost of 48,533*l*., or about 9·54 pence per cubic yard ; the actual cost of excavating clay and sand in 1882-83, including interest and depreciation of plant, ranged from 3·6d. to 4d, but in the following year it averaged only 2½d. per yard. The dredger at Lough Foyle worked still cheaper, the cost for excavation averaging only 2·18d., and the total expense, including conveyance for 10 miles, only 2·50d. The actual depth of the dredging in each instance is not given, but the Lough Foyle machine is capable of working in 35 ft. of water. One of the most extensive dredging works in operation is at the harbour and approaches to Baltimore, where the monthly excavations exceeded 500,000 cubic yards, and in six months 13 miles of channel were increased in depth from 24 ft. to 27 ft. for an average width of 250 ft., at a cost, on the average, of 18½ cents., or 9½d. per yard.

The most important chapter in the book is, perhaps, that in which Mr. Stevenson explains the instances in which his principles have been applied, and the results obtained therefrom, viz., on the Tay, the Ribble, the Lune, the Clyde, and the Tees. The description of the work which was carried on on the Clyde is particularly interesting, while the effect produced on the estuary of the Foyle is specially instructive, the depth of its channel having been increased 6 ft. 6 in. since 1853, while the tonnage of the port had increased nearly fourfold.

The explanation given as to the formation of bars at the mouths of estuaries may not, perhaps, commend itself to every one, but the arguments adduced certainly carry much weight ; though, if we remember rightly, they do not coincide quite with those given by Captain Calver, who is likewise a great authority on the subject. The treatment of bars cannot be uniform, but each case must depend on the particulars of its surroundings. The mouths of the Danube, for instance, situated in a tideless sea, require of course to be differently dealt with from those of rivers debouching on the Atlantic or Indian Oceans. As might be expected, Mr. Stevenson condemns the idea and practice of trying to reclaim flooded lands in the tidal or sea compartments of rivers, as reclamation can very rarely be attained except at the expense of the navigation. He cites, however, certain instances in which such processes may be carried out without detriment, but the instances are necessarily very few.

The treatise is concluded with a short chapter on the crossing of navigations by bridges, which the author rightly considers should only be permitted with certain essential stipulations as to sufficiency of headway, width of opening, and suitableness of position. He adds : "No one at present would propose to interpose a railway crossing and swing bridge between London and Greenwich." We trust not, but has not the Tower Bridge been sanctioned since those words were penned ? Though certainly within the limits of London itself, yet the portion of the river between it and London Bridge has hitherto been considered too valuable a location for shipping to admit of its ever being invaded by the obstacle of a bridge. What guarantee, therefore, remains of the railway interest not finding some day a very urgent necessity for con-

necting the two lines now running along its banks by a bridge still lower down the Thames?

THE LIVERPOOL CATHEDRAL COMPETITION.

THE report on the three designs, by Mr. Ewan Christian, long delayed on account of his temporary ill-health, has been now sent in to the Committee, who have at once, as it seems to us very unnecessarily and with questionable taste, made it public property through the medium of the Liverpool papers, in which it appears *verbatim*. Criticism by an eminent architect of the work of his contemporaries is a delicate matter in any case, and we should very much doubt whether the author of the report contemplated that his document should be treated as a public one. However, the cat is out of the bag now, so it is no use saying more as to how far the "propriety" of the Committee (as the German gentleman says in this week's *Punch*) ought to have extended in this direction; and Mr. Christian, we are given to understand, has acquiesced in the publicity after the fact.

Not that there are any very trenchant criticisms on any of the designs; what criticism there is, is expressed in a very moderate tone, as that of one desirous to say as little as possible to the detriment of any of the competitors. This fact, while it lessens the objection to publishing the report, makes it less interesting reading, no doubt, than it might otherwise have been, and also a less decisive guide to the Committee in their choice. In fact, one has to weigh and compare passages rather carefully to find out which design Mr. Christian really prefers. It does appear, however, at the close of the report, that he would recommend Mr. Emerson's design for adoption, although the previous portions of the report hardly prepare one for this conclusion.

In touching upon a few points in the report, we are glad to notice that Mr. Christian supports the selected site, as we have done previously, as being on the whole the best that has been suggested for the purpose, and one of which the advantages far outweigh the defects. On this point Mr. Christian observes:—

"There are those, I believe, who think that a striking position is all-important, and there are others who think that a cathedral should stand in a large open space, and that whether near or far away from the great centre of population is a matter of only secondary consideration.

The men of former ages rarely acted upon such views. Excepting St. Peter's at Rome,—the reasons for the comparative isolation of which are obvious enough,—and the cathedral at Pisa,—a great monument for which, with its adjacent buildings, open space was a necessity,—almost all cathedrals in large cities with which I am acquainted are to be found in the midst of the people they were intended to serve. The crowding round of houses and other buildings was little regarded, but the cathedral was a necessity of the daily life, and a central position was therefore of paramount importance.

That the cathedral church of a great commercial city should stand in the very heart and centre of that city is, to my mind, an axiom of the most evident truth and the very highest importance; that it should be a central gathering place for all classes, high and low, rich and poor; a place of prayer, open at all hours for those whose homes deny them the privilege of silent meditation. . . . .

That a cathedral may be so used, St. Paul's, in London, is now a bright example; that it might become dead and comparatively useless is, alas! too true; but a building, like a city, set on a hill cannot be hid, and in the bright light that would blaze upon it in the centre of multitudes there would be less risk of failure than when lost to view in more quiet portions of the town.

That this site is one of difficulty cannot be denied; that it is capable of considerable improvement, if the municipality think fit to deal with the adjoining properties in a large and liberal spirit, cannot, I think, be doubted; and if a high-level roadway from Dale-street were at any time to be effected, an opportunity would be afforded of combining with a cathedral so placed all the best buildings of the city, and of making an approach such as very few cities could surpass. That all this is possible is, in my opinion, certain; whether it is probable is not for me to conjecture or determine."

Taking first Mr. Emerson's design, the report notes that there are three distinct schemes:—A, No. 1, which treats the site as laid down; B, No. 2, which shows the nave lengthened one bay and encroaching beyond the western limits of the site, combining the design with the formation of a high-level street from Dale-street up to St. George's Hall; and C, No. 3, which is another variation, suggesting a different disposition of the buildings, but which the report passes over as of minor interest. In regard to Scheme B, Mr Christian refers to it as "a legitimate suggestion," which, of course, it is; but it may be observed that the author has apparently taken trouble to call special attention to this form of his design, which is really inadmissible by the terms of the competition,* and we find that all the illustrations published in our pages, which were selected by Mr. Emerson as those he wished published, were of this design, which really goes beyond the limits of the site. This would not influence Mr. Christian, of course, nor does it affect the real merits of the design, but it is rather a piece of special pleading with the public as against the other competitors, who have kept within the lines of the site. The practical points which Mr. Christian notes in favour of Mr. Emerson's design are, a fine floor plan, with little obstruction for the congregation, good and well-designed approaches and entrances, and presumably good acoustic qualities (though the report seems to state this rather on Mr. Emerson's authority than as the assessor's own opinion). The practical disadvantages noted are want of sufficient space for clergy and choir, in which the design falls very short of the other two. In regard to design, we will endeavour to select and condense from Mr. Christian's own expressions:—

"As regards the exterior, taking the respective portions *seriatim*, I would observe on the western façade that the general idea of breadth attained by placing the western towers outside the general lines is unquestionably good; and the idea of the open porch, adapted from Peterborough, is also good, but fails in effect, by reason of the want of mass, and flatness of the arches, as compared with the richer mouldings of its prototype. The simple dignity of the general front is marred by the unnecessary projection of the staircase turret on the western face of the south-western tower, which also overrides the boundary; and it is, I think, by no means certain that the steps shown in the larger perspective drawing, and which, under the present circumstances of the site, could not be had, would not be better omitted. There are, nevertheless, in this composition elements of a fine design, especially if the details of it were modelled, rather on the best English than on foreign examples.

Taking next the north and south flanks, the centre portions suffer from want of boldness in the treatment of the roofs; the semicircular vaultings at what may be called the four corners of the great central feature, seem almost to demand domical coverings, but are treated with flats; and the transept roofs might be higher with advantage. The porches also would seem to demand more projection where practicable.

The eastern end of the building is less satisfactory than any other, by reason chiefly of the management of the roofs, which seem to have but little relation to the curves of the apses which add so much beauty to the plane.

All these points are, I think, capable of improvement.

As regards the great central feature of the dome, the outline is good; but the small gablets shown would mar the general beauty of its form, and, as there is no real need for them, might be altogether omitted or changed for something of less projection. The great buttresses round the drum are constructive necessities; but there is no reason why their terminations should be ungraceful, and they are capable of being made things of beauty. The same might be said of most of the solid terminations of buttresses and pinnacles, which further study would doubtless considerably improve. . . . .

As regards the interior, I think the general lines are good, but there is much in the detail that requires further study; and I cannot but think that ancient English forms and practices are more suitable for an English cathedral than those which give the detail in which Mr. Emerson so largely indulges. I do not think the beauty of his design is increased, but very much to the contrary, by clothing the pillars of the choir with elaborate sculptures, which confuse the outlines, and detract from the simple dignity of the pillars. It is a practice almost unknown in England, and, so far as noble work is concerned, in my judgment more honoured in the breach than in the observance. The main structural lines of a church should be clear and unbroken, except by such minor banding lines as would not disturb the general harmony. Any amount of sculptured enrichments is admissible and interesting in subsidiary features, details of furniture, &c., but all main lines of structure should be clearly and strongly marked. Similar remarks would apply to some of the ornamental features over the intersecting arches in the dome, which do not improve the general effect. Notwithstanding these remarks on such ornamentation as I think out of place, there is remarkable beauty of design exhibited in several details to which such objections do not in any sense apply."

The general effect of this is, as will be seen on referring to the illustrations published in our pages (January 9 and January 23 of this year), that Mr. Christian admires the design as a whole, but objects to the greater part of the detail, and thinks it all capable of improvement; and we cannot say we differ from him on either head of the decision.

In speaking of Mr. Brooks's design, after observing that it is entirely confined within the lines of the site, and makes no suggestion for future developments, Mr. Christian notes, as the practical advantages of the building, a large extent of free and open area on the floor, ample doorways, the extra space of the triforium gallery (the real utility of which, however, he thinks may have been exaggerated), a large choir, and good vestry accommodation. The only practical defect distinctly noted is the rather insufficient size and circular form of the staircases to the triforium gallery. In regard to general architectural treatment, the only point Mr. Christian strongly condemns is the cutting up of the western façade by showing the sloping lines of the side aisles, and thus destroying the breadth and continuity of the whole. Here we certainly agree with Mr. Christian, and perhaps Mr. Brooks will, on further consideration. It may be more "honest" to show the raking lines on the façade, but honesty of this kind may be pushed too far, and certainly the finer effect is produced by continuing a horizontal screen wall to bind the whole façade together.* As to the slight differences in design in the two western towers, the main lines of which balance entirely, we cannot see why Mr. Christian should even glance at it as a defect; even a greater difference in treatment would have been quite in harmony with the spirit of Gothic architecture. Mr. Christian also finds the central lantern tower "disappointing." The placing of the two western towers clear of the main structure, so as to secure a great width of façade (also a feature of Mr. Emerson's design) Mr. Christian justly praises, as also the architectural effect, apart from any utilitarian consideration, of the before-mentioned triforium gallery; and speaking generally of the architectural character of the design, he says:—

"On the northern elevation the most striking and prominent feature is the transept, the treatment of which, with its fine portals, produces what is really a most beautiful composition, stately in outline, solid in structural lines, and rich in detail,—a piece of work pleasant to look upon.

The aisles are simple, and may possibly be deemed severe, but their treatment is characteristic and good, and the clearstory is well proportioned.

The eastern front calls for no special observations, and what has been said about the north will in great measure apply also to the south, but there are also some important variations.

Viewed as a whole, the design of the exterior is undoubtedly one of noble proportions, and vigorous and masculine character; but, having regard to the site, I cannot but think that the general structure is excessive in height.

As regards the interior, this remark perhaps would not so strongly apply, but it can hardly be doubted that the great height of the triforium is not attained without some sacrifice in respect of general proportions.

Mr. Brooks is of opinion that the acoustic properties of his church would be good, which I think probable."

Mr. Christian quotes at some length from Messrs. Bodley & Garner's report, in regard to their complaint of insufficient space; dissenting, however, from their views in this respect. He regards the plan as open to considerable practical objection, arising out of

* The instructions read, "The designs to provide for the erection of a Cathedral Church *on such a scale as the site will admit*."

* This was one of the points debated in a recent acrimonious controversy between two amateurs, Canon Venables and Lord Grimthorpe, in the *Times*, in which, as we observed at the time, Lord Grimthorpe was in the right, as he often is—on paper.

the planning of the piers of the central octagon, and the amount of clear view which the piers intercept. Mr. Christian proposes that the cardinal arches of the octagon should be made larger than the others (as in the ground-story plan under St. Paul's dome); this would do away with some part of the practical objection, but it would effectually spoil the architectural beauty of the octagonal crossing. In the main arcades also, Mr. Christian evidently thinks there is too large an area of pier for the voids, and proposes that the number of bays should be diminished and the arches widened. This is also in accordance with practical convenience, while adverse to effect and to the spirit of Gothic architecture. But it is obvious that the whole object of Messrs. Bodley & Garner's design is to produce a fine Mediæval building, not a practically suitable one; and it is noticeable that they alone among the competitors make no recommendation of the acoustic qualities of their design. Speaking of it architecturally, Mr. Christian says:—

"As regards architectural character, the great central lantern over the crossing is the principal feature of the design, and this would undoubtedly give a most noble and impressive massiveness to the whole exterior. I cannot, however, but think that if the lantern were crowned by a finely-outlined conical roof, covered with lead, the effect would be grander than that produced by the spire and upper lantern,* which are not suitable to the subject, are not necessary, and would detract from the general breadth and power of the whole composition. Even a roof of low pitch would be better than the spire, which seems to be out of place on such a structure.

The western front, its towers, and spires are not worthy of the subject, and, considering the depth and spaciousness of the porches, the approach to them is hardly compatible with the grand character of the structure within. The architects have adopted a somewhat elaborate style of detail, the disadvantages of which in Liverpool were pointed out in the last clause of the instructions to architects. This might be in some measure, but not wholly, modified without inconsistency with the general principles of the design.

The flanks of the cathedral show a noble range of clearstory windows, the effect of which would be undoubtedly beautiful, but would almost demand a large expenditure on painted glass.

Both the transepts and the eastern façade are capable of improvement, and the morning chapel is somewhat insignificant.

As regards the interior, inside as well as out, the central lantern is, of course, the principal, and a very noble feature, but the general proportions of structure are good, and the height not excessive. The narrowness of the four main arches and of the arches in the nave arcades in proportion to the piers is, however, very evident when considering the general internal elevation."

In regard to cost, Mr. Christian does not see that any of the designs need exceed the stipulated cost, 300,000*l.* We hardly think the contractor for any one of the designs would get very much out of that sum.

The latter part of the report sums up the general question, and we can best give an idea of Mr. Christian's views in some extracts from his own expression of them. After remarking that these designs must, after all, be regarded only as preliminary studies (what do the authors say to that?) he continues:—

"That any one design in its present state is entirely satisfactory I cannot say, and I think the detailed criticisms given already will sufficiently show; but there is a further and larger question which must be faced, and that is,—whether in any one of the designs can be found the church of the future most suitable for the cathedral of Liverpool? That it should be a church of grand proportions and noble form would, I imagine, be the general verdict of all good citizens; that it should have a spacious interior, well suited for the worship and teaching of multitudes, most would desire; and that it should be, like the church of Sta. Croce, at Florence, at once a place for grand religious teaching and for beautiful memorials of truly worthy citizens, might be a dream well worthy of realisation, but of which none of the designs can be said to have completely solved the difficulties.

Mr. Emerson has evidently attached much importance to the embellishment of the city by the striking and massive external proportions of his building, and it can hardly be questioned but that, if translated into stone, notwithstanding the proximity of St. George's Hall, his building would hold its own, and be a substantial addition to its architectural beauty. . . .

Mr. Brooks has put before you a powerful and in many respects very beautiful design, in the style of which he is an acknowledged master, but, as a whole, not so striking externally as it would be beautiful within. It is not free from faults which, though easy of correction, almost make one mourn their existence, compensated though they be by so many excellences; but I cannot avoid the conviction that his building, as a whole, would be too lofty for its position. The height of the general mass is really great even for an ordinary site, but for one so circumstanced as yours it would, in my judgment, be too over-powering for the surroundings. . . .

The design of Messrs. Bodley & Garner may be said to be more thoroughly English in character than either of the other two, and would, on the whole, produce a very fine church, of which the central lantern would be a notable and magnificent feature. . . .

Messrs. Bodley & Garner have also sent a drawing showing the original design by Sir Christopher Wren for rebuilding St. Paul's adapted to this site. Notwithstanding the great intrinsic beauty of that design as exhibited in the model, the plan was not one adapted to the requirements of worship as now understood; and although, as recorded, he was very reluctant to adopt the existing arrangement, one cannot but rejoice at the final determination which has given to posterity in the existing cathedral so glorious a monument of his unrivalled skill.

That was a preliminary study, and we see the final result. . . ."

This last strikes us as a singularly odd conclusion. In the first place, Wren reluctantly abandoned his first design for a plan which was forced upon him; in the second place, his first plan appears to be precisely suited for what he intended it for,—a church for modern congregational worship. After this, Mr. Christian concludes, as we have said, by his expressed preference for Mr. Emerson's design, though accompanied by the remark that he would have preferred an English Gothic design if there had been a thoroughly satisfactory one. Mr. Christian occupies so much space in remarking on the defects of detail in Mr. Emerson's design that the reason for his preference is not very clear in the report; we have no doubt it arose from a tacit feeling that the design, of the three, was the best suited to its situation and surroundings. We do not suppose it will suit the specially "Church" party at all; and of course the report has the force of a recommendation only. We, from the point of view of a "trade journal," as the *Church Times* obligingly calls us, concur in the opinion in favour of Mr. Emerson's design, for these three definite reasons: — (1) That it suits the surrounding buildings best; (2) that the plan is best fitted for congregational worship; (3) that it is the most original of the three. But we are obliged to confess that we go quite as far as Mr. Christian in the desire for a thorough reforming and refining of the detail; a reform which, in fact, to produce a satisfactory result, would have to be carried out almost to the point of re-designing the building, in all but its leading conception.

* We certainly concur with Mr. Christian on this point.

NOTES.

IT was not to be expected that the promoters of the Manchester Ship Canal scheme would allow the reverse experienced in July last to damp their ardour, and, after their failure to raise the required capital on that occasion, they adopted the very sensible plan of appointing a "consultative committee" to thoroughly examine the prospects of the undertaking. This committee, under the presidency of the late Mayor of Manchester (Alderman Goldschmidt), was quite independent of the board of directors, many of the members entering upon the inquiry with adverse rather than favourable opinions as to the commercial soundness and practicability of the project; but their report presented on the 9th inst. shows that they are now unanimously in its favour. Although the report is not based upon the statements in the prospectus, the committee find that the estimates for construction, maintenance, &c., given in the latter, were ample; and, without making very extravagant statements as to anticipated dividends, they set forth clearly their reasons for being thoroughly assured that it would prove a profitable undertaking and remunerative investment. Their inquiry has apparently been most exhaustive, the objections to, and weak points in, the scheme being specially considered, and the result should reassure hesitating speculators. A significant feature of the report is the recommendation to re-constitute and strengthen the board of directors before again inviting subscriptions. There is no doubt that the floating of an enterprise of this nature depends almost as much upon the manner in which it is placed before the public as upon its intrinsic merit.

"OUR Empire of Rivers" is the title of a pamphlet lately issued,* with a view to show, first, the consequences of neglecting the natural waterways of this country, in their diminished capacity through silting, and then the necessity for taking adequate measures to enable them to perform the duties originally allotted to them, but for which they are growing yearly more inadequate. The writer argues that owing to their beds having been allowed to rise, they have in many instances ceased to perform their particular function of drainage, and that, consequently, water which used to be in constant motion by flowing off to the streams which feed the rivers, now remains stagnant, and becomes a breeding-ground for pestilential germs. Our rivers, he argues, are either nearly empty or else overflowing, and he proceeds to advocate the planting and preservation of forests at their sources, which will act as reservoirs for the rain, and from which there will be a gradual filtration into the river streams; in fact, the great lesson to be learned is that, if we are to have rivers and streams about London maintained in a natural condition, we must re-afforest the high lands, and replant the river banks throughout the entire empire. The writer considers that an appeal must be made to Government for a Forest Act, and avers the necessity for immediately establishing a Department with power over our woods and forests, hills and uplands, and rivers, similar to that in India and other countries, but with greater powers. There is a good deal of sensible writing in the pamphlet, and therefore it is decidedly worth perusal, though probably many will be disposed to call in question some of its deductions. The author is Robert T. Cooper, M.A., M.D., of the London Homœopathic Hospital.

THE Commercial Museum movement appears to be making rapid strides in more than one place on the Continent, and particularly in Belgium, which, small as it is, has a truer appreciation of commercial progress than any other country. The museum at Liège is to be divided into two sections, the first embracing articles of import, with a statement in each case of their origin, their price at the port of shipment, cost of transport, customs' duties, and conditions of sale. The second section will be devoted to articles in demand for foreign markets, with all particulars as to packing, &c. A museum is also to be established at Charleroi. Dresden is acting with great energy in the matter, and its museum already contains samples of almost every Saxon industry, to which no fewer than 250 manufacturers have contributed. The articles are intended for export, and it is hoped that the shippers of Bremen and Hamburg will be induced to co-operate largely. The Buda-Pesth Museum lays itself out more for the East; and in connexion with its operations it publishes a journal giving all information as to prices, transport rates and customs' duties, together with lists of liquidations and insolvencies in other countries. Even in such out-of-the-way places as St. Sebastian in the North of Spain, and Bahia in Brazil, permanent commercial museums have been formed. In connexion with this subject, we may mention that the French have started a system of floating exhibitions. The *Sarthe* is fitting out at Marseilles, and the *Château Lafitte* and *Château Léoville* at Bordeaux, with the object of exploiting the West Indies and the northern coasts of South America. It behoves us to make a note of these things, and, more than that, to act upon them.

* Published by Mr. Whiteley, Westbourne-grove.

IT is not often that we should feel inclined to take Russia as our pattern in her internal economy, although we cannot help thinking that what she is now doing in land reclaiming might certainly be done with equal success in Ireland. The Russian Government is now, and has been for some time, engaged in draining the Pinsk marshes, a district larger than Ireland, impassable for the size and number of its bogs, and covered with an impenetrable forest of undergrowth and jungle. Up to the present some four million acres have been reclaimed, and the programme of the coming year includes the drainage of 300,000 acres by means of 120 miles of canals and dykes. Upwards of 600,000 acres of bog are now good meadow land, while two million acres of the jungle have been brought into cultivation. The engineers certainly have not been slack in their endeavours, for they have built 179 bridges, sunk 577 wells, and surveyed 20,000 square miles. The amount of bog in Ireland would, of course, be child's play to the Pinsk marshes, but somehow we are always confronted with bog as the chief source of Irish difficulties. If its annihilation will pay in Russia, it ought to do so in Ireland, nor should we forget that an undertaking of such magnitude would bring immediate and constant work from the very outset to half the able-bodied population in the country.

THE recent report by Mr. Binnie, the Waterworks Engineer to the Bradford Corporation, on waste of water, will somewhat astonish water-consumers, who trouble themselves little about the matter unless a very dry season makes its appearance, and there are signs of scarcity. Then there is a great outcry against waste, and naturally so; but no reflection is ever given to the fact that the waste against which we have to guard is a constantly recurring evil, and one that cannot easily be prevented. The water-supply in one of the districts in Bradford, with a population of 81,000, was at the rate of 22·47 gallons per head per day. Mr. Binnie considered this far too much, and came to the conclusion that there was waste; and he introduced the system of subdividing the district into several smaller ones, each provided with Deacon's self-recording meters, which register on a diagram from minute to minute the amount of water passing through them. By gradually narrowing the area of the sub-divisions, it became possible to find out the sub-division, the street, and even the house where waste occurred. By means of this inspection the daily supply of 22·47 gallons per head was brought down to 14·35. Even then there seemed to be a waste, according to the meters' diagrams, of 5·35 gallons per head,—so that when all this was checked, it was found that the Bradford consumers really had only a supply of 9 gallons per day, with a full and constant pressure, and this without the slightest complaint or feeling of scarcity. In one year, therefore, 472,510,000 gallons were saved, representing to the Bradford Corporation a sum of £12,800 per annum. Other provincial towns have followed the same system. The general employment of a meter system of water-supply we have long been convinced is what must be looked to in the future, as the best means of checking waste, avoiding disputes, and allowing free use of extra quantity to those who wish for it, without wasting it on those who do not.

WE have received a pamphlet on "The Right to Lateral Support from Land and Buildings," by Mr. G. G. Gray, barrister. It is a discussion of seventy odd pages on the cases of Lemaitre *v.* Davies, which decided that there is a right of support by buildings to buildings, and Angus *v.* Dalton, which was a still better known decision on the law of support. Lemaitre *v.* Davies was decided at the end of 1881, and has not been, and does not seem likely to be, overruled. The decision in that case must, therefore, be accepted as an accomplished fact. Mr. Gray's discussion is, therefore, altogether academic. It is interesting, but it does not convince us that the decision in Lemaitre *v.* Davies was wrong. Mr. Gray's work is altogether a legal treatise, and our readers are interested only with the result of the case discussed, and but little with the legal grounds on which it is based. Mr. Gray observes that Lemaitre *v.* Davies "has attracted but slight and inadequate notice." Although this journal is not a legal one, the case was carefully criticised in our number of March 11, 1882.

UNDER the title of "The Vital Statistics of the City of Glasgow," the Medical Officer of Health, Mr. James B. Russell, M.D., has published an elaborate system of tables. Their interest, other than strictly local, is chiefly due to the light they throw on the arguments which have been so stoutly alleged by the opponents of the measure proposed from time to time for the purification of the Clyde, to the effect that "the health of the citizens had not suffered, and though the smell was very offensive at times, it was not deleterious." These words were used by a speaker at a public meeting held at Glasgow, to consider the question of the purification of the Clyde, on the 9th of October last. The death-rate of Glasgow for the last six years has ranged between 25·23 and 26·90 per thousand; the density of the population in 1885 being eighty-nine persons to an acre. Out of twenty-four statistical divisions of Glasgow and its districts, however, the death-rate ranges from 16·1, for Kelvinhaugh and Sandyford, with a population of forty-six persons per acre, to 41·8 for Bridge Gate and Wynds, with a population of 207 per acre. The name of the latter district is suggestive of proximity to the Clyde. But the sanitary condition of Glasgow bears witness to that general neglect of the main requisites of healthy cleanliness, of which the state of the River Clyde is but an outward and visible sign. The general healthiness of site and climate is shown by the low rate of 16·1 in the first-named district. Increased density of population is a usual cause of increased death-rate, and something may be due to differences of level; but it is difficult to avoid the conclusion that much of the differential pressure of 25·7 per 1,000 is due to causes preventible by ordinary cleanliness.

AMONGST the minor proposals which the Metropolitan Board of Works will introduce into Parliament in the course of next Session is one to give them further powers in respect of the widening of Elm-street along its southern side, from Gray's Inn-road to Mount Pleasant; and another to provide that for all purposes of drainage and sewerage the now detached portion of St. James, Clerkenwell parish at Muswell Hill, shall cease henceforth to form part of the metropolis as by statute defined.

IT is curious to notice the "fits and starts" sort of sanitary policy which some Local Boards and Vestries carry out. The Hammersmith Vestry, shaking off a torpor which was, perhaps, due to some extent to its municipal connexion with Fulham, has issued at one sweep nearly fifty notices to owners, requiring them to provide a suitable supply of water, and suitable water-supply apparatus to closets upon premises, pursuant to the provisions of the Metropolis Local Management Acts; and to nearly forty owners, requiring them to provide suitable dust-bins. The same authority has issued a public announcement that notice must be given to the surveyor before any drain for the drainage of any premises is covered in, and that in default proceedings will be taken against the delinquents. These seem patent powers under the Metropolis Local Management Acts, but in Fulham and Hammersmith they have been so seldom exercised that members of these Vestries even doubted whether they had the power to do what they propose now to enforce with so much newly-awakened energy. It goes without saying that a Local Board or Vestry is responsible for much bad sanitary work if it is ignorant of or has not used the powers of supervision which lay in its hands; and some of the metropolitan as well as suburban sanitary authorities are by no means free from this sin.

RECENT advances in science and changes in the administration of sanitary laws have certainly increased the duties of the sanitary inspector. There is a vacancy for this post with the Twickenham Local Board, the salary being 100*l.* per annum, and it would appear from the list of duties formulated by a committee that the official has not only to know something of drains and nuisances, and the laws referring to them, but of the management and diseases of cattle. The duties are detailed as follow:—(1) To perform all that may be necessary under the Public Health Act, 1875, in that capacity; (2) Inspector under the Canal Boats Act; (3) Inspector under the Contagious Diseases (Animals) Act; (4) Inspector under the Petroleum Acts; (5) Inspector under the Food and Drugs Act as far as possible; (6) Inspector under the Factory and Workshop Act (Bakehouses); (7) also under the Towns Improvement Clauses, so far as they refer to slaughter-houses. The candidate will be preferred who has a certificate that he has passed an examination, the nature of which is not pointed out. The spread of education and a fuller recognition than hitherto on the part of the public of the importance of maintaining good sanitary surroundings, will undoubtedly demand more extensive knowledge and skill than have been ordinarily thought sufficient for the requirements of the office; and sanitary inspectors will be more than human if they do not think that increased remuneration should go along with increased duties.

IT is a somewhat curious circumstance that although the Local Government Board permits Vestries and Local Boards to add to their advertisements for tenders for works, "The lowest or any tender not necessarily accepted," it not infrequently requires explanation as to why the lowest tender has not been accepted, when such is the case. Of course, good grounds should be forthcoming when the lowest tender is not accepted, or the compulsory rule to advertise for tenders would be simply a farce, and the act would be manifestly unjust to those who had taken the trouble to send in estimates. The central Board has just refused to sanction a loan to a suburban Local Board for the making-up, kerbing, and channelling of some roads until it has inquired into the circumstances which induced the Local Board to accept a tender which was higher than three of those sent in. The subject is one of considerable importance to contractors, and the decision and observations of the central authority are looked forward to with interest. The work was tendered for in three contracts; and the aggregate tenders of the chosen firm amounted to 7,238*l.* There were six lower tenders for one contract, and three lower for each of the others. If the Local Board had taken the lowest tender for each contract, the aggregate would have amounted to 6,293*l.*; and the three rejected tenders of three firms would have amounted respectively to 7,025*l.*, 6,819*l.*, and 6,314*l.* The firm whose tender was accepted was, no doubt, one which commands confidence; but no remark was made that the other competing firms were inferior in this respect. Some of the members of the Local Board, however, asserted that they had done only what they would have done had the job been one for themselves, and what they considered served best the interests of the ratepayers; but this kind of proceeding causes, at all events, much loss and apparent injustice to contractors, from whom we have heard many complaints about it lately.

THE *Eastern, Australasian, and South African Journal of Commerce*, in an article entitled "The Conservation of Ancient Buildings," laments the disappearance, or threatened disappearance, of bits of Old London, such as Staple Inn, and asks, "Why not reproduce in Australian or other colonial cities the charming streets, inns, and nooks peculiar to Old London, Chester, and hundreds of British provincial towns, but constructed on the principles of modern sanitary science?" Our American friends, it may be added, seem

to have half adopted the idea, for a street somewhat similar to the "Old London" of recent exhibitions at Kensington is about to be built on a plot of land in New York. Mr. George H. Birch, F.S.A., from whose drawings and under whose superintendence the South Kensington reproductions were made,—and than whom, from his special knowledge of old buildings, no one is more qualified for the task,—has been retained as architect for the New York reproductions, and he sailed for New York last week.

WHEN it is remembered how many of the conveniences and necessities of modern every-day life depend on indiarubber or gutta-percha, the growing scarcity and consequent ever-increasing price of these materials is a fact of sufficiently serious import. It is therefore gratifying to learn, through the journal of the Royal Agricultural Society of British Guiana, that the exports of the juice of the bullet tree (*Mimusops balata*) are increasing. This juice is a milk-like secretion, and resembles gutta-percha in some respects and indiarubber in others. Dr. H. Muller had submitted a sample to an indiarubber manufacturer, who said that he treated it as a superior kind of gutta-percha; but it would appear that it is a distinct substance from gutta-percha, being somewhat softer at ordinary temperatures and not so rigid in the cold. It also has the advantage of not becoming brittle when exposed to light and air, whilst the properties of insulating for electricity are said to be equal to gutta-percha. Balata has been known for the last twenty-five years, but it is only recently that it has grown into commercial importance. In 1882 the quantity exported was 105,112 lb., the price in the English market being about 1s. 3d. per lb. The industry of collecting the gum appears to be carried on principally on the Canje river, which falls into the estuary of the Berbice river between the Amazon and the Orinoco. The bullet tree reaches at times to a height of 120 ft., and has a large, spreading head. The trunk is 60 ft. to 70 ft. long, and 4 ft. to 5 ft. in diameter. The majority of the trees are, however, much smaller than this. Over how great an area the tree flourishes does not appear to be definitely settled; at any rate, the collectors do not go more than a two days' journey from the settlements.

A WATER-METER, constructed on Frager's system by M. Charles Michel, is described in the *Bulletin de la Société d'Encouragement* for 1886. The meter acts on the positive principle of direct measurement, there being two vertical cylinders side by side, with reciprocating pistons which have no rods, being deep enough to be self-guiding. Each one is fitted with two discs of indiarubber in contact with each other, the edges of which are spread so as to form a packing to make the pistons watertight. The distribution of water is effected by means of a chamber which is separated from the cylinders by a suitable partition. There are to each cylinder three ports, and to effect the distribution there is a slide-valve, worked by means of a valve-rod passing through a stuffing-box, so that this part of the arrangement is somewhat similar to an ordinary steam-engine. The middle ports serve for discharge, whilst admission is effected through those at the ends: the latter, however, are not in contact with the cylinders immediately beneath them, but with the adjoining cylinders, so that each piston actuates the valve of its neighbour. The pistons have each a trunk, and from these the valve motion is taken. When the piston is near the end of its up-stroke it strikes the valve-rod, causing it to travel a distance varying, in different-sized meters, between $\frac{1}{4}$ in. and $1\frac{1}{2}$ in. When the piston has nearly completed its downward stroke a projection on the lower end of the valve-rod comes in contact with the trunk, and the valve is thus caused to descend. In this way each cycle of operations consists of four alternate movements of the pistons, and four cylinderfuls of water pass through the meter. A head of 39·37 in. suffices to work the apparatus, and the record is made by a ratchet-wheel in the usual way.

SOME tests have been made of the pumping-engines of the Mulhausen Low-Service Water-works, which are not without interest. These engines were constructed by the Alsatian Society, and are of the compound horizontal condensing type, with receiver. The pumps are connected directly to the piston-rods. The cylinders are 18·7 in. and 26·6 in. in diameter, by 39·37 in. stroke. The pumps are $9\frac{1}{2}$ in. in diameter, and of the same stroke. The tests were made under the superintendence of Mr. Walther Meunier, when the following results were recorded. Working pressure in boiler, 97 lb. absolute; revolutions, 27·42; piston speed, 180 ft.; and I.H.P. 65·1. The steam consumed per I.H.P. per hour was 16·38 lb., and the pumps raised 1,00!,220 gallons of water per minute to a height of 183·44 ft., showing a power in useful work done of 55·64 h.-p., which would be equal to 19·196 lb. of steam per unit of useful work. The efficiency would therefore be 85·3 per cent. At a previous trial the efficiency of the engine was found to be 89·6 per cent., and the efficiency of the pumps 95·2 per cent. These details are abstracted from the "Proceedings of the Institution of Civil Engineers," vol. lxxxvi., p. 81.

WE called attention last week [p. 834] to the important discovery of the Leonidaion inscription at Olympia. This week the *Philologische Wochenschrift* (No. 50) reports the finding of a beautiful archaic head, worked in very low relief. It belongs to the time just before Pheidias. The subject, if conjectured, is not yet reported. It was found just outside the recently-discovered street of tombs, so in all probability it belonged to a funeral stele.

MISS HARRISON'S lectures on the Myths of Attica as illustrated in Greek vase paintings, of which we gave a summary in our last, are to be redelivered before the Association for Higher Education at Oxford.

AT their weekly meeting, on Friday, December 3rd last, the Metropolitan Board of Works resolved to make the following changes in the nomenclature and numbering of certain well-known thoroughfares. Charles-street, Grosvenor-square, to be, henceforward, Carlos-street, W.; Rochester-row, St. Pancras, to be incorporated, for postal and other purposes, with Rochester-road; Bolton-row, St. George's, Hanover-square, to be numbered in continuation of Curzon-street, and to lose its distinctive style; Great Vine-street, St. James's, Westminster, to disappear into Warwick-street; and Heddon-court, in that same parish, to be numbered with and merged into Heddon-street.

WHILE discussion has been rife as to what to do with the old baths at Bath, some one seems not to know what to do with the new ones exactly, inasmuch as an unfortunate labourer, William Mortimer, was killed by the fall of an arch there a few days ago. The matter is very briefly reported in the *Bristol Times and Mirror* of the 10th, from which it appears that the jury gave the following verdict:—"We find that the deceased, William Mortimer, met his death accidentally through the falling of an arch at the New Baths, owing to the east wall of the building not being of sufficient strength or thickness to resist the thrust; and the jury are further of opinion that it would be unsafe to construct another arch on the same wall. We agree to exonerate the contractors from all blame." This seems in effect to be a verdict against the City Architect. We are informed that the arch was a half-brick ring of 10 ft. 6 in. span and a little more than 3 ft. rise, backed on the haunches with concrete to the upper floor level, and that a 1 ft. 6 in. wall against which it abutted was pushed out, and the arch fell. What weight was on the arch beyond the concrete we have not been able to learn. Such an arch could hardly have pushed out a well-built 18-in. wall if carried up so as to give a considerable vertical load above the springing of the arch; but with a "green" wall only up to the springing or thereabouts, we could well understand it. Without more detailed information as to the facts we abstain from decisive comment; but it appears from a letter in a Bath paper subsequently that the architect, Major Davis, said that "he would build it the same way again." If this is true, and seeing that a man has been killed, we presume Major Davis considers the blame is with the contractors. Something certainly wants explaining about the matter.

THE ACADEMY PRIZE DRAWINGS.

THE Architectural Travelling Studentship at the Royal Academy, which is naturally the one to which we are bound to give the first mention, has been awarded to Mr. E. H. Sedding. The subject is a design for "an entrance to a public park, with lodges and colonnade on either side." It is a pity that the words "and colonnade" were included in the specified subject, as this rather ties down the competitors to a certain form of architecture, and some of them might otherwise have suggested something preferable to "a colonnade," or, at all events, less hackneyed. The prize design, however, whatever else it is, is certainly not "hackneyed"; it has decided faults and anomalies, but these are redeemed by a very distinctive originality, and we concur in the award of the prize for this reason. The peculiar feature of the design is that, instead of a colonnade converging up to a central entrance, the author puts a flat screen in front of his composition, bringing the lodges near together with a central gateway between them, and behind this he places a large elliptical court, surrounded by a double colonnade, its larger axis at right angles to the front screen, and with two arches at the further extremity, forming the real and final *débouchement* upon the park. This is by no means the way to treat an entrance. There is no sense or meaning in interposing this enclosure between the apparent and the real entrance to the park. The two arches forming the inner gateway from the court into the park are very odd in design, being formed of massive piers, one on either side, connected by a light arch like a piece of cross wall or flying buttress treated in a decorative manner, instead of a solid arch of the same depth as the piers. The tops of these arches, as well as of that which spans the outer gateway, are designed in scrolls in a kind of clock-case manner, looking, in fact, very like wooden construction imitated in stone. All this is very much open to criticism, but it, at all events, shows the effort on the part of the designer to think for himself and to do something different from what has been done before; and for this let him have full credit. The design numbered 323, in which a semicircular colonnade sweeps up on either hand to the central entrance, is a much more correct and more effective way of planning an approach of the kind, but the details of the design are only what can be easily got out of books, and not the best even in that category. No. 324 is a little more original, but the author has spread out his design too much laterally, thus getting the lodges at the extremity of it a great way from the real entrance. The iron gate, with figures worked into it, is designed with spirit.

The first of two silver medals (second not awarded) for measured drawings of architecture, is awarded to Mr. G. T. M'Combie for drawings of the Henry V. Chantry in Westminster Abbey, which are very well and carefully executed, and in which his only competitor by no means disputes the prize with him.

The silver medal for the perspective drawing in outline (architecture) was given to Mr. Ayling for a clever drawing of a circular staircase in St. Paul's Cathedral, including, however, a greater angle than the eye can take in, and consequently appearing forced and unreal. The designs for the 25*l.* prize for a set of drawings illustrating an architectural design are not of much account, that by Mr. Russell, to which the prize is awarded, is the best; and the treatment of the centre part of the elevation (it is a design for a court-house for a county town), with the broad archway for the public entrance below, and the more decorative story above, is good, but the lantern seated on the roof is terribly heavy and out of proportion. The architectural designs generally for this and the remaining

architectural prizes are hardly worth commenting upon specially, and are certainly below the mark of what we should expect to see among Academy students.

In sculpture the models from the life were of a high standard, particularly the set of three, for which Mr. Pegram obtained the prize of 50*l*. The subject for this year's ideal group was the Brazen Serpent. The scale of the models, we presume regulated by the examiners, is smaller than on many previous occasions; not an improvement, to our thinking, for small scale modelling tends (as obviously in some of the present examples) to mere rough sketching of features instead of real modelling. The group, by Mr. Venner, to which the first prize of 30*l*. was awarded, has the defect of not emphasising the subject; two men struggling in contorted attitudes are succumbing to the serpents, and the one figure, a kneeling woman, who is looking towards the healing symbol, is quite in the background of the group and might even be overlooked. The second prize, awarded to Mr. Frampton for another group of the same subject, seems also rather doubtful; the group is finely and expressively composed but rather marred by a degree of archaism, and certainly not very carefully modelled in detail. Among groups that tell the story well and forcibly were those numbered 299 and 296, the latter especially, which seem to indicate a study of Flaxman's style of grouping and arrangement of line in subjects of this class.

A silver medal for a line drawing in perspective, "open to sculptors and painters only," we are glad to note was taken by a lady (Miss Gayton); the sex are seldom good perspectivists, and, indeed, painters generally are so often deficient in the perspective of their architectural subjects that it is well their attention should be specially drawn to this. The subject of this perspective study is the staircase of the Academy, as seen from the entrance-hall, and Miss Gayton's treatment of it seems perfectly correct and satisfactory.

The subject for the Armitage prize for a study for a figure-picture is this year, "Balaam blessing Israel," a very good subject, was well treated by Mr. Sidney Paget, who has deservedly gained the first prize. The other designs showed mostly an intention to make something of the dramatic contrast between the action of Balaam and that of the disappointed Barak, but in a curiously naïve way mostly, and it was hardly surprising to find that the second prize was not awarded.

In the life-size cartoon studies of draped figures the prize was given to a very effective study of Moses, standing in a monitary attitude in front of the Brazen Serpent, by Mr. Bell, the figure being draped in one white garment, with a dark mantle depending from the extended arm, and half covering it. This is a fine cartoon, and the arrangement of the drapery seems really to help the expression of the figure, as drapery should. Of the designs for decoration for a public room, only two can be said to be decorative at all in the strict sense, 89 (to which the prize was awarded) and 92; the rest are merely pictures. No. 89, by Mr. Draper, is a bright composition of figures, illustrating "Spring" (the subject given), but the full-size cartoon of the central figure,—a girl in long drapery,—is rather uninteresting, and the face coarse in style. Of the others, 88, a ploughing scene, is a very pleasant picture in itself, and the cartoon of the ploughman good; and in 95 the cartoon of the flying goddess of spring is very good, perhaps the best thing in this set, but the composition generally is far too misty, and full of clouds, &c., to be suitable for decorative effect on a large scale.

The award of the Creswick prize puzzles as it has done before. The subject is "A Harbour at Low Tide," and the prize is given to Mr. A. T. Foster for a painting certainly showing some very good work in detail, but which is less than any of the others an illustration of the subject, which the author has really shirked, putting some craft in the foreground and looking up country for the rest of his picture. That by Mr. Rooke (honourable mention) is certainly a more genuine and effective treatment of the subject given; No. 11 may be referred to also as a painting with artistic feeling; and No. 5, by Mr. Carlill (honourable mention), only wants some more force and reality of texture and local colour to be a very successful rendering of the subject. The prize for a copy of an oil painting was not largely competed for, and went to Mr. J. D. Penrose, for a copy of a Richard Wilson. The copies, hung in conjunction with the original, were all very faithful in form and balance, but not one showed any resemblance to the tone of the original.

The following is the

List of Prizes and Prize Winners.

Landscape Painting, subject, "A Harbour at Low Tide," Creswick Prize, awarded to Arthur John Foster; *Proxime accessit*, Arthur Trevethin Nowell; Hon. mentions, Barnard Rooke and Steven Briggs Carlill.

Painting of a Figure from the Life, Silver medal, 1st, awarded to Henry Barrett Carpenter; 2nd, George Goodwin Kilburne.*

Painting of a Head from the Life, Silver medal, 1st, awarded to John William Perrin; 2nd, Fred. Henry Alex. Parker.

Copy of an Oil Painting, Portrait of Molière (from the Dulwich Gallery), Silver Medal, 1st, awarded to Jas. Doyle Penrose; 2nd, Leonard Aug. Pownall.

Copy of a Landscape, Italian Scene, by R. Wilson, R.A., Silver medal, awarded to Will. Geo. Wilson.

Cartoon of a Draped Figure, subject, "Moses with the Brazen Serpent," Silver medal and prize (25*l*.), awarded to Robert Anning Bell.

Design in Monochrome for a Figure Picture, subject, "Balaam blessing the Children of Israel," Armitage prizes, 1st (30*l*.) and Bronze medal, awarded to Sydney Paget; 2nd (10*l*.), not awarded.

Design for the Decoration of a Portion of a Public Building, subject, "Spring Time," Prize (40*l*.), awarded to Herbert Jas. Draper.

Drawing of a Figure from the Life, Silver medal, 1st, awarded to Alfred Ansell; 2nd, Fred. Sam. Beaumont.

Set of Six Drawings of a Figure from the Life, 1st Prize (50*l*.), awarded to Albert Starling; 2nd (25*l*.), Alfred Ansell; 3rd (15*l*.), Chas. Will. Bartlett†; 4th (10*l*.), Geo. H. Sydney Cowell.

Drawing of a Head from the Life, Silver medal, 1st, awarded to Helen Sarah Squire; 2nd, Florence Helena Burgess.

Drawing of a Statue or Group, Silver medal, 1st, not awarded; 2nd, Harold Plantagenet Mostyn.

Drawing of a Statue or Group, Prize (10*l*.), awarded to Alice Maria Dicker.

Perspective Drawing in Outline (open to Painters and Sculptors only), subject, The Staircase leading to the Exhibition Galleries, as seen from the Entrance Hall of the Academy, Silver medal, awarded to Anna Maria Gayton.

Model of a Design, subject, "The Brazen Serpent," 1st Prize (30*l*.), awarded to Will. Hy. Totterdale Venner; 2nd (10*l*.), Geo. Jas. Frampton.

Set of Three Models of a Figure from the Life, 1st Prize (50*l*.), awarded to Henry Alf. Pegram; 2nd (20*l*.), Will. Goscombe John.†

Model of a Figure from the Life, Silver medal, 1st, awarded to Will. Goscombe John; 2nd, Arthur George Walker.‡

Restoration of a Mutilated Antique Statue, The Torso (in the Royal Academy), Silver medal, awarded to John Rhind.

Model of a Statue or Group, Silver medal, 1st, not awarded; 2nd, John Rollins.

Model of a Statue or Group, Prize (10*l*.), awarded to Henry Chas. Febr.

Design in Architecture, subject, Entrance to a Public Park, with Park-keeper's Lodge and Colonnade on either side, Travelling Studentship (60*l*.), awarded to Edmund Harold Sedding.

Set of Architectural Drawings, subject, The Chantry of Henry V. in Westminster Abbey, Silver medal, 1st, awarded to Geo. Thos. McCombie; 2nd, not awarded.

Set of Architectural Designs (Upper School), Prize (25*l*.), awarded to Sam. Bridgman Russell.

Set of Drawings of an Architectural Design (Lower School), Prize (10*l*.), awarded to Colin Campbell Wilson; Hon. mention, Charles Edward Mallows.

Perspective Drawing in Outline (open to Architects only), subject, The Staircase to the Library in St. Paul's Cathedral, Silver medal, awarded to Robert Stephen Ayling.

The Landseer Scholarships in Painting and Sculpture, of 40*l*. a year each, tenable for two years, given for the best work done in the examination for passing into the Second Term of Studentship, have been awarded:—In Painting, to Barnard Rooke and Henry Barrett Carpenter; in Sculpture, to Arthur George Walker and William Henry Totterdale Venner.

* Disqualified, owing to having received the same Medal in 1883.

† Disqualified, owing to having received the same Prize in 1885.

‡ Disqualified, owing to having received the same Medal in 1884.

TESTS FOR BUILDING MATERIALS.

WITH a view to the simplification of the researches incidental to determining the relative merits of building materials, various technical bodies on the Continent have of late propounded and discussed schemes for the application of more or less uniform tests in such cases. These proposals have been framed with special reference to particular destructive influences to which the substances in question are liable to be exposed, amongst which may be specially noticed the action of soluble salts, the effects of frost, the influences of heat, air, rain, changes of temperature, &c., and, finally, the results of fire.

The presence of soluble salts is detected (according to Dr. Seger's proposal, submitted in 1885 to the Munich Commission) by the evaporation of a solution in a pulverised condition of the substances under investigation. These salts, it has since been remarked, may have existed in the clay from which the bricks, &c., have been made, or in the water used for softening, while it is also considered possible for them to have been introduced during the process of baking, by the presence of sulphuric or muriatic acid. It is thought more reliable to make these tests upon samples extracted from the internal portions of bricks, as the expulsion of the salts in question from such portions is more difficult than from nearer the surface. These salts are principally sulphates and metallic chlorides, the former being by far the most injurious. Tests for carbonate of lime, pyrites, specular stone, &c., are made upon the clay, as baking destroys these substances.

Porosity and resistance to frost have likewise given rise to exhaustive discussion; Dr. Seger's proposed tests including the capillary absorption of water during twenty-four hours, followed by total immersion. The specific gravity has to be defined, so as to afford a basis for calculating the proportion between the space of the pores and that occupied by the solid portion. The use of an ice-machine has been recommended as a substitute for immersion in a cold mixture, by reason of the large bulk to be tested, and in order to save time. A period of four hours at a temperature of 5° Fah. has been found sufficient to freeze the bricks thoroughly. The repetition of the freezing process ten times has been deemed sufficient, the subsequent application of tests for pressure being accompanied by similar tests of bricks which have not been previously subjected to the trials of freezing. The *Thonindustrie Zeitung* remarks, however, that to obtain in this way results of a definite character as to resistance against frost, it would be necessary to make more numerous tests than might generally be practicable or convenient.

The statements of Herr Bauschinger regarding the proposals of a Sub-Commission of the Munich Conference include detailed recommendations as to uniformity of size in samples of stone to be tested; the lateral length being about 2¼ in., on account of the difficulty attending the application of severe tests to larger samples. Comparative information should, it is considered, be furnished as to the quarries, and even the parts of them, from which the samples originate. The degree of dryness is understood to be that of constant weight. Gradual immersion in water is recommended to prevent the action of various influences which would result from sudden immersion, distilled water of 59° Fah. being used. The samples when saturated with water should be placed in a closed metal vessel in a liquid or mixture, kept during the four hours' trial at 5° to 14° Fah. The water is again applied when the process of freezing is over. The thawing takes place in air at 68° Fah. Regarding the effects of sun, rain, air, and temperature in general, it is admitted that experiments of a reliable character are not easily carried out, and hence it is suggested that the appearances which have actually been noticed should be recorded in a comprehensive form, as a basis for more detailed consideration of the subject.

It would seem that tests of resistance to fire have only of late formed part of the trials made at German testing establishments, this arrangement having doubtless been prompted by the action of the Berlin police in limiting the employment of granite supports. Comparative tests of Saxon granite have shown the following results as to pressure, the samples experimented upon being 2·36 inches in length and in width, the surface exposed to pressure being thus about 5·57 square inches:—

	lb. per sq. in.
1. Air-dried, average of 10 trials...	15,287
2. Saturated with water, average of 10 trials	15,200
3. Frozen in the air (from 5 trials)	14,444
4. Frozen under water (from 5 trials)	15,014
5. After 8 hours exposure to fire...	9,525

Herr Frangenheim, in the *Deutsche Bauzeitung*, remarks that these tests are deficient in practical value, from the fact that the sudden cooling of the heated stone which takes place in consequence of the application of water at fires is not represented in the experiments described, the importance of such a test for the stone used in staircases being specially advocated. His own trials have shown the rapid destructibility of basalt-lava stone (possibly by the expansion of the air in the crevices, &c.) under the circumstances indicated. He has also remarked that many descriptions of stone were injured by fire at the edges, while the internal

portions remained intact. Only in one instance (a sandstone with siliceous mortar) the sample withstood the influence of fire, even at the edges.

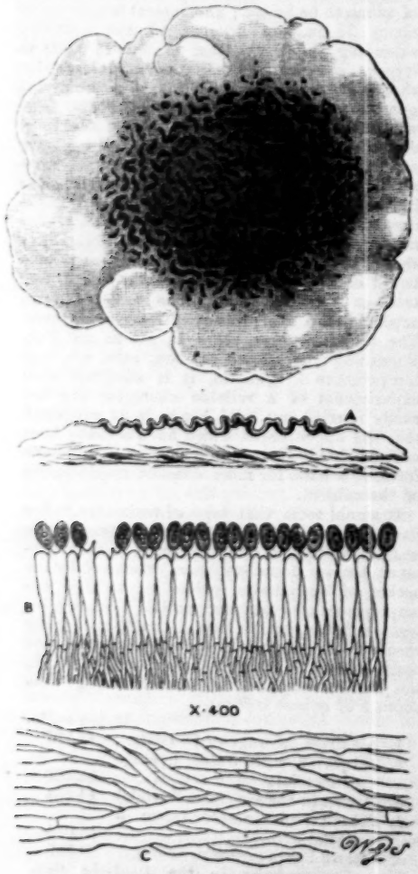
It has, however, been remarked that these tests (carried out at the instance of private individuals or official bodies) do not fulfil all requirements, and it is therefore suggested that the principal quarries should be inspected, with a view to samples of their products being examined and grouped together, with the assistance of the present testing establishments; central and local exhibitions bringing the facts thus arrived at within the reach of those whom they most interest. As an instance of the practical advantages to be derived from a more accurate knowledge of the properties of building materials, it is stated that German roofing slates are now considered fully equal to those of English origin, although some years ago it was officially stated that the latter were indispensable to the German building industry.

THE DRY ROT FUNGUS.

MERULIUS LACHRYMANS.

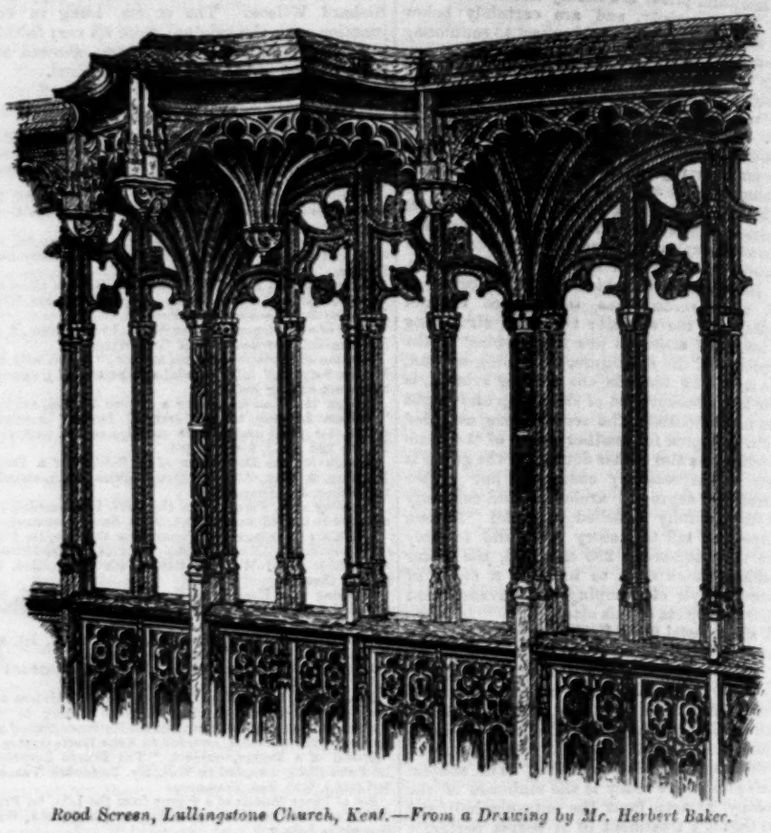
We are indebted to the *Gardener's Chronicle* for the accompanying illustrations of the structure of this disagreeable form of vegetation, and from the same journal we extract the following remarks, which may be of interest to architects and builders who have to deal with it:—

The dry-rot fungus is one of the most widespread and destructive of all fungi. It is especially common and well known on the squared timber of ill-ventilated buildings, and from dressed wood it will quickly spread to walls, whether built of stone, brick, or concrete. It will often grow through the mortar of a thick wall, and perfect itself on the bricks both outside and inside. We have seen it growing on damp concrete between the girders of iron fire-proof floors, and seen it spread from wood on to plate-glass, and perfect itself on the latter substance whilst drawing its nourishment from the wood. In wine-cellars it will spread from the wood-work and walls to the bins and even to the corks of wine-bottles. The mycelium of the fungus will luxuriate between the cork and the neck of the bottle; a slight attack of this sort is said to make the wine "corky."



Merulius lachrymans (*Dry rot*).

A.—View and section of part of fungus (natural size).
B.—Wrinkled portion, magnified 400 diameters.
C.—Interwoven tubes forming fleshy portion, similarly magnified.

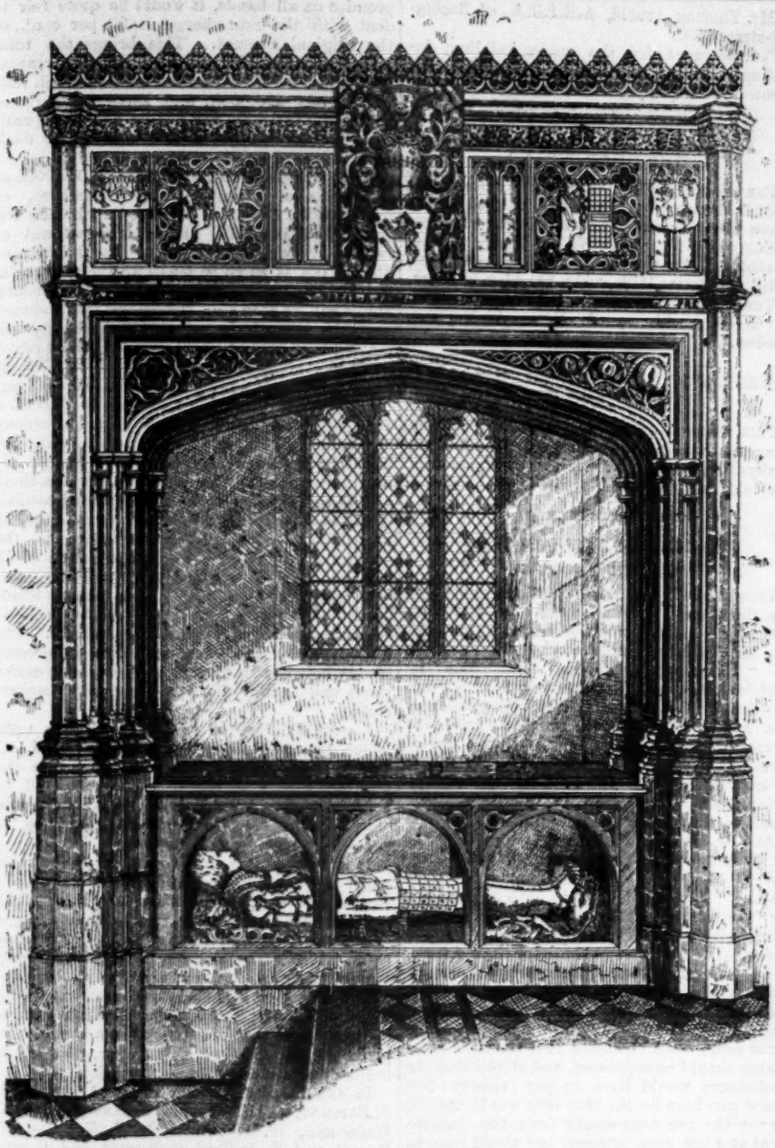


Rood Screen, Lullingstone Church, Kent.—From a Drawing by Mr. Herbert Baker.

The dry-rot fungus prefers the squared unpolished wood of coniferous trees as a substratum on which to luxuriate, but we have seen it on polished mahogany, and it will spread from other woods to teak, and destroy teak-built ships. It is not uncommon on the fallen timber of pine woods, but, like some other plants, it has long been peculiarly associated with man and his dwellings. It destroys churches, houses, ships, bridges, railway sleepers, telegraph-poles, and many other objects. It must not be assumed, however, that the true dry-rot fungus is the sole depredator. There are twelve British species of *Merulius*, inclusive of *M. lachrymans*, and several of these appear at times in our houses. We have seen *M. corium* almost as destructive as *M. lachrymans*. In addition to the dry-rot fungi, it is by no means uncommon to find buildings destroyed by different species of polyporus, lentinus, and other fungi.

Merulius was so named by Fries on account of the shallow pores or wrinkles of the spore-producing surface, and *lachrymans* on account of the drops of moisture, like tears, which stud the fruiting surface of the fungus when growing in full vigour.

The upper part of the accompanying illustration shows a small plant of a dry-rot fungus; the circumference is white or livid in colour, and thick and fleshy. The whole plant is fleshy, and almost meaty when cut. The odour is very strong and mushroom-like. The livid rim consists of transparent interwoven fungus tubes and cells as illustrated enlarged 400 diameters at C; tubes of this nature and size also form the entire base of the fungus. The fungus cells or tubes break down the substance of the wood upon which they grow and transport the juices of the wood to the fungus for nourishment. The central part of the surface of the *merulius* is rich reddish-brown in colour and indented with coarse shallow pores or wrinkles, as illustrated in the upper figure. A reddish livid juice is exuded from all parts of this fungus; this juice stains every object with which it comes in contact. A section of the wrinkled surface is shown natural size at A. Every part of the reddish wrinkled surface produces spores, the same portion distils drops of moisture chiefly derived from the wood upon which the fungus grows. By breaking down the substance of the wood and extracting its juices the timber is ultimately left in a state little better than dry sawdust or powder: hence the popular name of "dry rot," a curious name for a naturally wet or "weeping" fungus. If a very small fragment is cut from the wrinkled surface of an example of *Merulius lachrymans*, and a very thin transparent slice is then removed from the exposed surface and examined with a microscope, it will be seen, if enlarged 400 diameters, as at B. The coarse transparent tubes of the base of the fungus become much narrower as they gradually grow up towards the brown wrinkled surface, and in the latter position they support tall colourless cells or bladders as shown; each tall bladder throws out four minute horns or spore-supporters at its apex, and on each horn an oval spore of rich brown colour is borne, as illustrated. When the ripe spores fall from their supports on to damp wood in close confined air they germinate and throw out fine mycelial tubes, the tubes penetrate the sweating wood and soon produce a perfect dry-rot fungus by drawing from the wood the material necessary for the life and well-being of the fungus. The fungus continues to grow till the supporting timber is completely exhausted and reduced to tinder or dust; the fungus itself now perishes, but not before it has produced myriads of spores which have probably been carried away by currents of air to destroy other damp wood or wood in damp places. The dry-rot fungus will under favourable conditions attain a very large size; its dimensions appear, in fact, to be only limited by the size of the object or material on which it grows; we have seen huge thick growths, like large pancakes, a yard or more in diameter. As the growth of the fungus is as rapid as it is exhaustive, it follows that when dry rot once gets a footing in an ill-ventilated building the work of destruction is rapid and complete. Floors rot, roofs fall, galleries collapse, and window-sashes turn to powder and drop out. As the air of the infested building is full of dry-rot spores it is useless to replace old wood with new, for new wood merely supplies fresh food for the fungus. Sometimes improved ventilation is beneficial, but it is impossible to really cure dry rot, and almost if not quite impossible to stop its progress when once well started, as the fungus is always ready to invade various other materials in addition to wood. To keep well clear of dry-rot its attacks should be prevented.



The Tomb of Sir John Peche, Lullingstone Church, Kent.—From a Drawing by Mr. Herbert Baker.

ROOD SCREEN AND MONUMENT, LULLINGSTONE CHURCH, KENT.

The monument and rood-screen from Lullingstone Church, Kent, here illustrated, were specially referred to in our pages a few weeks since, in a review of the last number of the *Archæologia Cantiana*, page 755, *ante*. The illustrations are reduced from drawings by Mr. Herbert Baker.

WEST LONDON SCHOOL OF ART.

The annual presentation of medals, prizes, and certificates to the students of the West London School of Art took place at the school, Great Titchfield-street, last week, there being a very large muster of the students and their friends. The walls were covered with a large number of the works executed by the students during the past year.

Mr. G. A. Thrupp occupied the chair, and opened the proceedings by expressing his regret that Mr. P. H. Calderon, R.A., who had shown great interest in the work of the students, and who had promised to distribute the prizes, was suffering from illness, and was unable to attend. He then called upon Mr. G. G. Simpson, the Head-Master, to read the annual report.

The report stated that in no previous year of its existence has the school attained anything like the success of the past year, in prizes, examinations, and grant in aid. 312 students attended the classes,—119 in the morning, and 193 in the evening. The school fees amounted to 834*l*. 14s. 4d. The claim of the school upon the Government for payments on results, in aid of the school, is 447*l*. 17s. 3d. In the Second Grade or elementary examinations in freehand and model drawing, geometry, and perspective, twelve students obtained full certificates for passing in all four subjects; twenty-one students gained the mark Excellent, and sixty papers were marked Pass, making a total of eighty-one successes, and being a percentage of nearly twenty-six against twenty-three for last year. In the Third Grade or advanced examinations in drawing in chalk from the living model, the antique, ornament and geometrical models, in painting from still life and ornament, in designing figure and ornamental composition, in questions on the elements and principles of ornament, in perspective (theory and practice), in anatomy of the human figure, in elementary architecture, and in outline drawing from casts of ornament, eleven students gained Excellent, 63 Good, and 18 Fair, making a total of 92 successes. Seven students, Georgina Barbier, Edwin Holder, Elizabeth Laker, Emily Mitchell, Mary P. Parry, John W. Parsons, Arthur Balliol Salmon, were successful in obtaining this certificate,—more than double the number recorded in any previous year. The total number of works sent in to the Science and Art Department by all the schools in the kingdom (227) for examination this year was 324,815. The students of the West Londen School contributed about a hundredth part of that quantity, and received one-twenty-seventh of the entire number of prizes given. In the National Art Competion the percentage of awards was the same as in 1884, viz., 4½ per cent. It is the highest percentage obtained by this school. This year it is made up as follows:—One gold medal, one silver medal, four bronze medals, and eight Queen's prizes of books. The percentage of Third-Grade prizes gained by the students is very much in advance of any former year; the highest previous record being in 1884, when 14 per cent. of the students gained prizes, as against 18½ per cent. this year, fifty-eight prizes being awarded. Five students,—Minnie Aumonier, Charles J. L. de Beaupré, Agnes Guest, Florence Hannam, and William H. Woodall,—were awarded Government Free Studentships for the excellence of their year's work. These studentships are tenable for one year. Two students,—H. B. Matthews and Alfred C. Weatherstone,—gained each a National Scholarship of the value of 52*l*. a year, and tenable for two years. These scholarships were created by the Government "to enable advanced students, who may have given evidence of special aptitude for design, to prosecute their studies in the Training School and South Kensington Museum." The Travelling Studentship of the Painters' Company, of the value of 50*l*., was this year awarded to C. J. L. de Beaupré, for the coloured decoration of a vestibule.

Mr. Thrupp, prior to distributing the prizes, delivered an interesting address to the students, in which he pointed out that art schools were established in 1837 more especially for furthering the artistic education of those engaged in manufactures, or who looked forward to entering pursuits where the knowledge of painting and drawing would be of importance. Their object was to educate the artist by instructing him in the technical part of his work by training the eye to clearly and correctly see, and the hand to execute that which the eye saw in due proportion and symmetry. He regretted, however, that advantage had not been taken of them in the metropolis as they had hoped by those classes for whom they originated and supported these schools, viz., those by whom artistic works were and are actually designed and manufactured. There was one quality necessary to the designer,—imagination,—which could not be secured, and could only be partially assisted, by the course of study pursued there. A true artist must *create*, not simply copy. In France, where the artistic education of the workman commenced much earlier than in this country, clay statuettes and graceful groups in bronze, truly artistic in character, were produced; and why should not such work be produced here, instead of being chiefly imported? Were our workmen trained to the decoration of ceilings and walls in a manner equal to foreigners? If not, was it because our artists confined themselves to the execution of paintings to be hung upon walls? Mr. Thrupp concluded by advising the students to avail themselves to the utmost of the advantage of the libraries in that institution and at South Kensington; and then proceeded to distribute the prizes, which included the following:—Bronze medal, for tempera paintings of figures from the antique, awarded to Henry E. Tidmarsh; bronze medal, for water-colour painting of drapery arranged on the antique figure, to Leonard F. Wyburd; Queen's prize, for design for a wall-paper, to George Fayers; book prize, for excellence in advanced perspective, to William H. Woodall; prize for building construction (advanced stage), to Charles Bryant.

Votes of thanks to the Head-Master and his assistants, to the Chairman, and to Mr. C. A. Hindley, the hon. sec., terminated the proceedings.

Surveyorship, Willesden.—At a meeting of the Willesden Local Board on the 14th inst., it was unanimously agreed that the salary of Mr. O. Claude Robson, Surveyor of the Board, be increased from 500*l*. to 700*l*. per annum.

New "Salvation Army Barracks" were opened last Monday at Tunbridge Wells. Seating accommodation is provided for 900 persons. The total cost, including 200*l*. for extra foundations which had to be put in, owing to the nature of the ground, to a depth of 23 ft., was 1,500*l*. The site, costing 300*l*., was given to the "Army" by the Misses Wells, of Tunbridge Wells. The front elevation, we are informed, "is designed in the Jacobean style, with a modern feeling." Mr. F. J. Coxhead, of Leytonstone, Essex, was the builder, and the architect was Mr. E. J. Sherwood, of 101, Queen Victoria-street.

Illustrations.

SKETCHES IN TEWKESBURY ABBEY.

THESE two illustrations, reproduced from pencil sketches by Mr. R. W. Paul, represent two tombs in Tewkesbury Abbey Church. Of their history we believe nothing is known. They are given here as examples, in the first place, of very good sketching, and as interesting specimens of a certain type of monument, in two late and closely-connected phases of Gothic style.

WESLEYAN CHAPEL, &c., CORPORATION-STREET, BIRMINGHAM.

WE give an illustration of this building, the design for which, by Messrs. Osborn & Reading, was selected in a limited competition. The buildings include on the ground-floor fronting Corporation-street two large shops, with basements under, and a smaller shop with basement in the Lower Priory. The inclination in the adjoining streets admits of a level entrance from Dalton-street to the basement of these shops. The principal entrance to the chapel premises is in the centre of the Corporation-street front. The general disposition of the buildings is sufficiently shown by the plans. The chapel will accommodate 300 persons.

The whole of the first floor and staircases are constructed with fire-proof materials. Separate staircases are provided for the hall, so that it may be used independently, one at the corner of Dalton-street and Lower Priory and the other from Dalton-street. The materials used in the elevations are Darley Dale stone on the ground or shop storey, with red brick facings and Corsham Down stone in the upper storeys, the high-pitched roofs being covered with red tiles. The work is being carried out by the contractor, Mr. John Bowen, under the direction of the architects.

RESIDENCE, HAMPSTEAD.

THIS house is now in course of erection in the Chislett-road.

The exterior walling is executed in picked red facings, with Bracknell rubbers, the stonework throughout being Portland. Broseley tiles are used for the roof.

The builder is Mr. Mansbridge, Kilburn, and the architect is Mr. Banister Fletcher.

CONGREGATIONAL CHURCH, GEORGE-LANE, WOODFORD.

THIS church occupies a good site in George-lane, not far from the station of that name on the Great Eastern Railway.

The plan consists of nave and aisles, apsidal choir, and transepts. At the principal front is the tower entrance, large vestibule and retiring-room, while at the opposite end of the church is the organ-chamber, class-room, vestries, heating-chamber, and other accommodation. The church is seated for 604 persons on the ground area, exclusive of end gallery.

Externally the walls are built of Kentish rag, in closely jointed and level random courses, with dressings in Bath stone. The roofs are covered with red Broseley tiles.

In the interior stone is largely used. The pillars of the arcade have their bases to 3 ft. above floor of Portland stone in one piece; the shafts are of Mansfield stone, each in one piece, 5 ft. 6 in. long, which (as they are on the natural bed) required to be cut from blocks of unusual size. The capitals and large springers of the arches are of Portland stone, and the remaining voussoirs of the arches of Bath stone. The windows of nave and clearstory are of two lights; of transepts, four lights; and over the front entrance, of five lights. The moulded strings, corbellings, &c., are of Bath stone. There is a good deal of carving both internally and externally, the execution of which was entrusted to Mr. Samuel Allen. The roof of the centre aisle is continued of the same height through the nave and choir, and its general effect and construction are shown on our drawing. The choir, which is raised two steps above the nave, and the vestibule, are paved with encaustic tiles, while the passages are laid with wood blocks. The pewing, pulpit, choir seats, screens, &c., are of pitch pine, and outside doors of teak.

The work has been satisfactorily carried out by Mr. James Morter, builder, of Stratford, from the designs and under the superintendence of Mr. Thomas Arnold, A.R.I.B.A., of Basinghall-street, E.C.

The contract for the entire building, including boundary-wall, but exclusive of belfry of tower, and spire, amounts to 5,113*l.*

ADDITIONS TO "SHERWOOD," TUNBRIDGE WELLS.

THE accompanying illustration is from a pen-and-ink drawing by Mr. Frank Baggallay, and shows the new wing, entrance-hall, and tower to Sherwood, Tunbridge Wells. The work was carried out for the late Sir William Siemens, F.R.S., by Messrs. Willacombe & Oakley, builders, of Tunbridge Wells, from designs by Mr. Lewis P. Crace, architect, of Nottingham-place, London.

DESIGN FOR MISSION CHURCH AT MOSBOROUGH.

THIS illustration represents a drawing of a proposed mission church at Mosborough, Derbyshire, submitted by Mr. J. D. Webster, of Sheffield, in a recent competition.

SURVEYORS' INSTITUTION.

THE TITHE QUESTION.

THIS subject has engaged the attention of the Surveyors' Institution at its last two meetings. At the meeting held on the 22nd ult., Mr. J. Willis Bund, Associate, read a paper on "Extraordinary Tithe," in which he criticised the mode of redeeming it which was afforded by the Extraordinary Tithes Redemption Act, 1886, a measure which, he said, was "rushed" through Parliament on the eve of a general election, to satisfy a local grievance, without the full significance of the change which it would bring about being present to the minds of the legislators.

At the meeting held on the 6th inst., Mr. W. J. Beadel, M.P., President, in the chair, Mr. E. Ryde, past-President, read a paper entitled "The Tithe Question; with Suggestions for the Redemption of the Rent Charge." After giving an interesting account of the historical and legislative phases of the question, and showing that the popular prejudice against the payment of tithe rent-charge was deep-seated and widespread, he referred to the proposals which he had made on the subject a few years ago,* when he hinted that the tithe rent-charge should be redeemed, and stated that the landowners would have to pay twenty-five years' purchase for it; that they would have to borrow the purchase-money from the Government at 4 per cent. interest, and would have to continue the payment of the interest for a period of about forty years, when it would cease. His present proposals did not much depart from those suggestions, and during the last five years he had canvassed the views of men eminently well qualified to influence public opinion, and he saw no difficulty in adjusting every difference of opinion which had been communicated to him. Having enumerated and replied to the principal objections which had been urged against his proposals, he gave, in conclusion, the following outline of the scheme of redemption which he proposed:—

"The total value of the tithe-rent charge, as commuted and apportioned, is, in round figures, 4,000,000*l.* per annum and upwards. I cannot deal with actual figures, because small redemptions have taken place from time to time, which may have reduced the amount to the round figure of 4,000,000*l.* Of this round figure about three-fifths, or 2,400,000*l.*, is in the possession of parochial incumbents, the remaining two-fifths being in the hands of impropriators.

It is proposed, in the first place, to reduce this 4,000,000*l.* to 3,800,000*l.* by deducting from it five per cent. for the cost of collecting. In the next place it is proposed to take from it 400,000*l.*, being the difference, in round figures, between the value of the rent-charge in 1886, and the commuted rent-charge in 1836. This is done on the supposition that the average price of corn for any seven years in the future will not approximate more closely to the average price of the years 1828 to 1835, upon which the rent-charge was originally based, than 90 per cent. There is great fear that the average price will be less than that figure, but in a measure which can only be regarded as a compromise on all hands, it would be quite fair to deal with the rent-charge at 90 per cent., of the original amount. This brings the total rent-charge to 3,400,000*l.*, and it is very reasonable to assume that the rates and taxes will take off the odd 400,000*l.*, and leave a net round figure of 3,000,000*l.* per annum as the approximate measure of the rent-charge to be dealt with.

It is proposed to redeem this 3,000,000*l.* at the price of twenty years' purchase, or 60,000,000*l.*, but it is proposed to borrow the sum of 75,000,000*l.* (being the amount of twenty-five years' purchase). The balance of 15,000,000*l.* is to go to make up the augmentations to the income of the parochial incumbents, and it will be seen that the 15,000,000*l.*, spread over the three-fifths of the rent-charge, will make an additional eight and one-third years' purchase. The interest on the 75,000,000*l.*, at 3 per cent., will amount to 2,250,000*l.* a year. There will therefore be a surplus of 75,000*l.* a year to be applied as a sinking fund to recoup the principal. This, at 3 per cent., will overtake the principal in forty-seven years. It may here be added that if from any cause there should be occasion to raise additional capital, it will be easy to do so by slightly extending the period of the loan. The difference in the amount accumulated by a sinking fund of 1*l.* per annum for forty-seven years and fifty years is as much as 12·8 per cent. The amount which in forty-seven years will accumulate to 100*l.*, accumulates in fifty years to 112*l.* 8*s.* The difference in value to a landowner in present money between freeing his estate in forty-seven years and in fifty years is practically inappreciable.

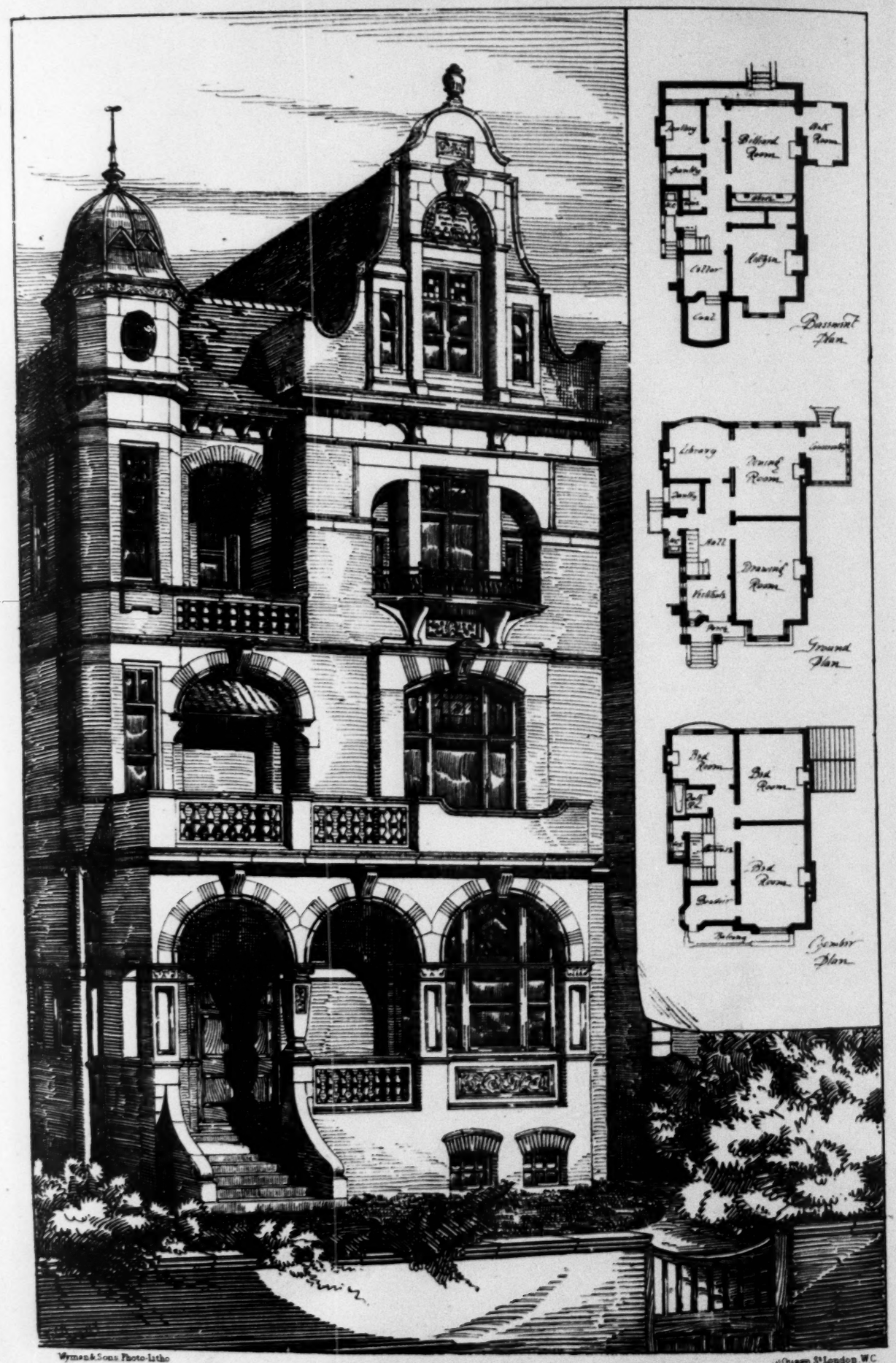
I scarcely dare to suggest the mode upon which the new stock should be created. I would, of course, make it a condition that the purchase-money to the tithe-owner should be paid in that stock, so that the whole of the obligation of the Government would be to provide for the issue of the stock.

It will, of course, be understood that in this paper all reference to the Extraordinary Tithe Redemption Act, 1886 (49 and 50 Vic., cap. 54), has been avoided for the reason that a paper on that Act, written by Mr. Willis Bund, is to be discussed with the present paper. It may be that much of the rent-charge to be created under that Act in lieu of extraordinary tithe will be redeemed voluntarily. But it is well to add that if any general redemption should take place on the lines of this paper, the extraordinary rent-charge should be included."

In the discussion which followed Messrs. A. J. Burrows, C. K. Bedells, J. Henry Sabin, J. Waterman, W. J. Harris, J. W. Kemsley, E. Powell, and E. Ballard took part, and it was resolved, on the motion of Mr. C. Oakley, to adjourn the further discussion of the papers to the next meeting.

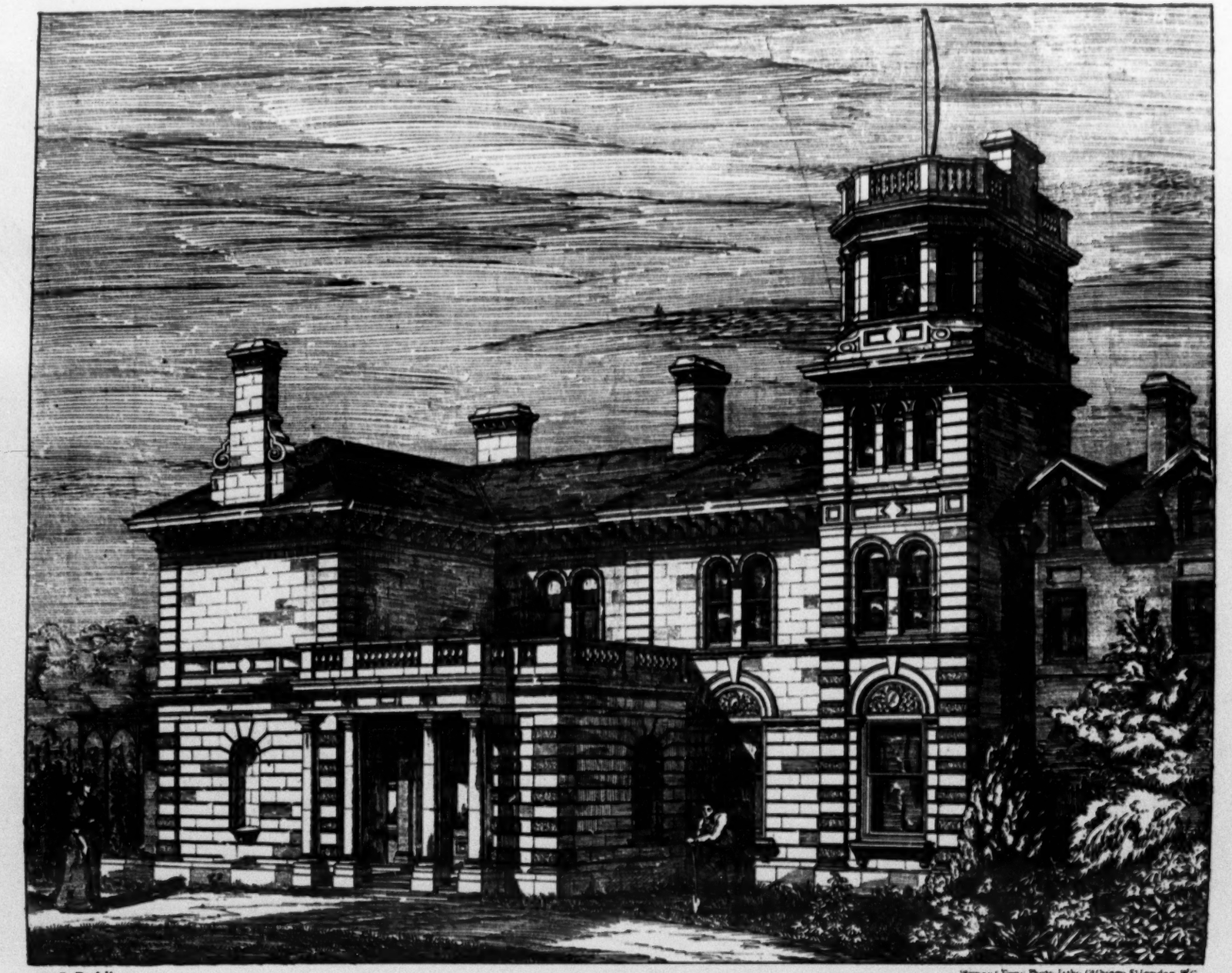
* In his Opening Addresses as President of the Institution, 1880-81.

The Queen's Park Estate, Harold Wood. Last week Messrs. Baker & Sons offered for sale, at the Princess Alice Hotel, Romford-road, Forest-gate, the first portion of the Queen's Park Estate, Harold Wood. The estate, which adjoins the Harold Wood station of the Great Eastern Railway, has recently been laid out for building purposes, the principal thoroughfare being Queen's Park-road, which intersects the centre of the estate. The number of plots submitted on Wednesday was 122. Nearly all of them have frontages of 15 ft. and 16 ft. each, with depths varying from 60 ft. to 100 ft. The property offered included a large hotel plot at the eastern boundary of the estate, and several shop plots in the Broadway, one of the thoroughfares on the estate, forming a continuation of the main highway to Brentwood. Before offering the several plots Mr. Baker observed that there was no reserve upon them. The sale then commenced, and the first lot, having a frontage of 15 ft. to the Queen's Park-road, and a return frontage of 60 ft., was sold for 7*l.*, the auctioneer remarking that this was not the value of agricultural land. All the other plots were sold at prices ranging from 7*l.* to 8*l.* 10*s.* each, with the exception of a number of shop plots, which realised from 10*l.* to 13*l.* each, and the hotel plot, which, with two other plots sold with it, realised 76*l.* The general opinion in the room appeared to be that the property had been sold much below its real value, and the auctioneer observed that it was a proof of the depreciated value of landed property at the present time.



Wyman & Sons Photo-litho 74 Queen St London W.C

HOUSE AT HAMPSTEAD.—MR. BANISTER FLETCHER, F.R.I.B.A., ARCHITECT.



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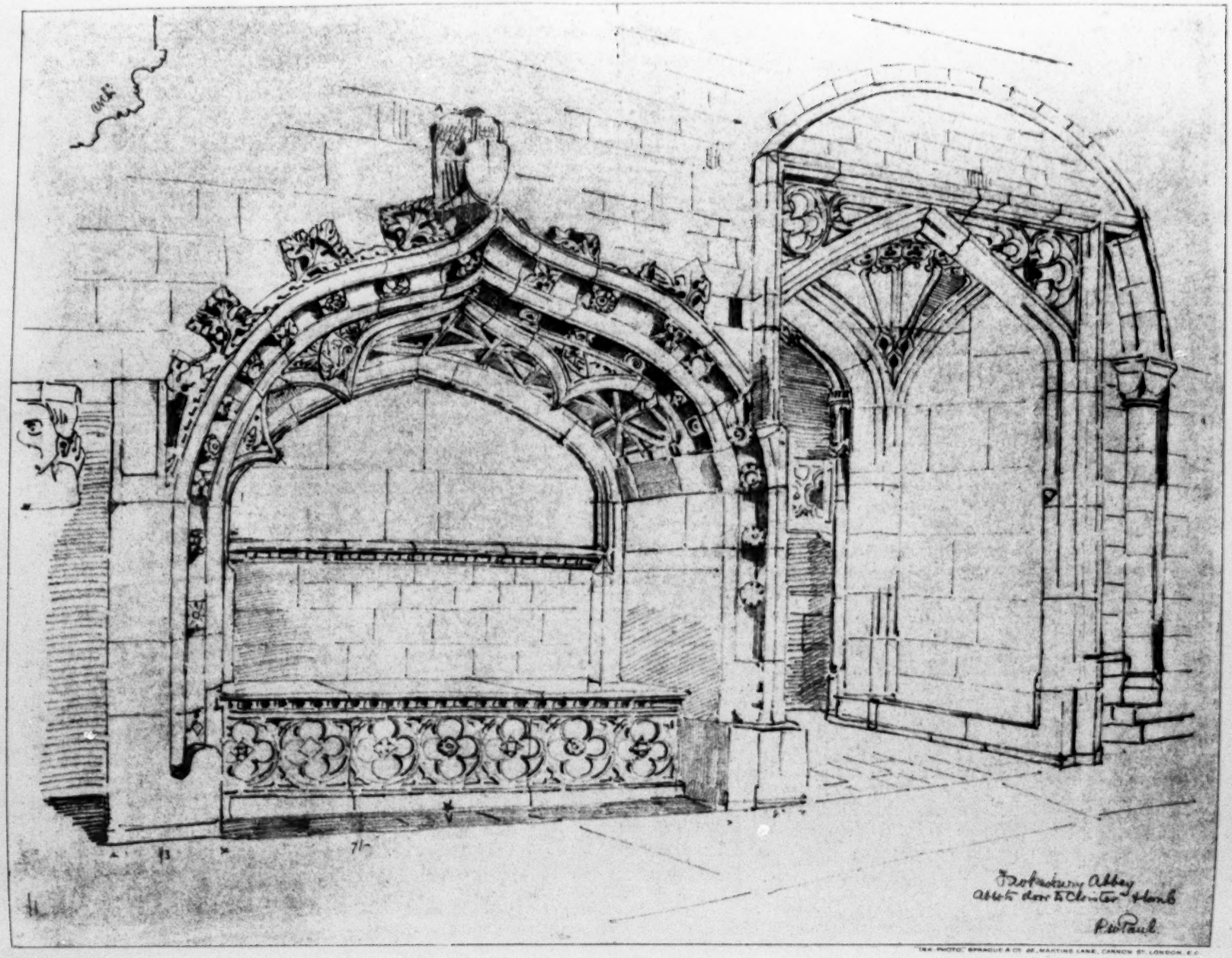
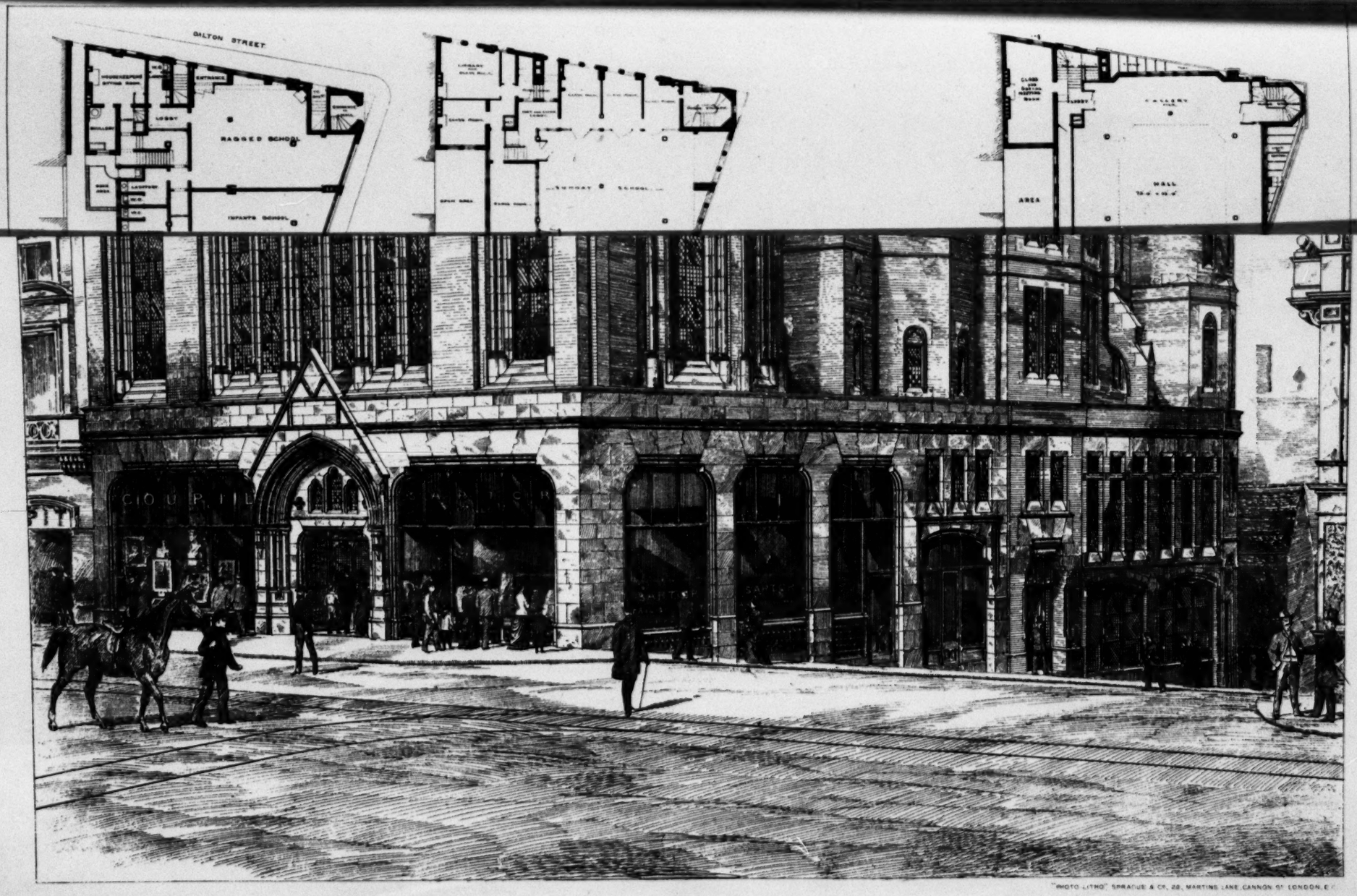
ADDITIONS TO SHERWOOD, TUNBRIDGE WELLS.—Mr. L. P. Crack, A.R.I.B.A., Architect.



A SKETCH IN TEWKESBURY ABBEY, BY MR. ROWLAND W. PAUL.



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WESLEYAN CHAPEL SCHOOLS AND PREMISES, BIRMINGHAM.—Messrs. Osborne & Reading, Architects,

"PHOTO-LITHO" SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

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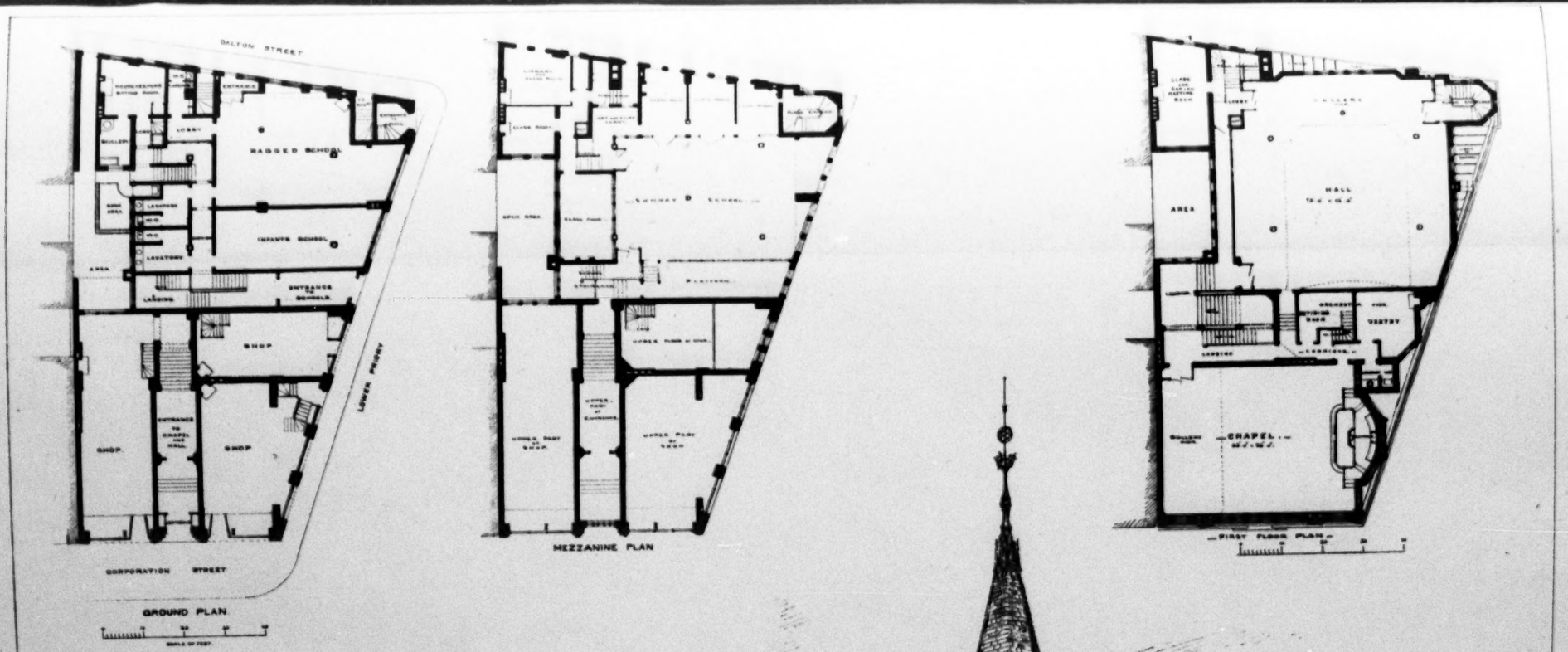

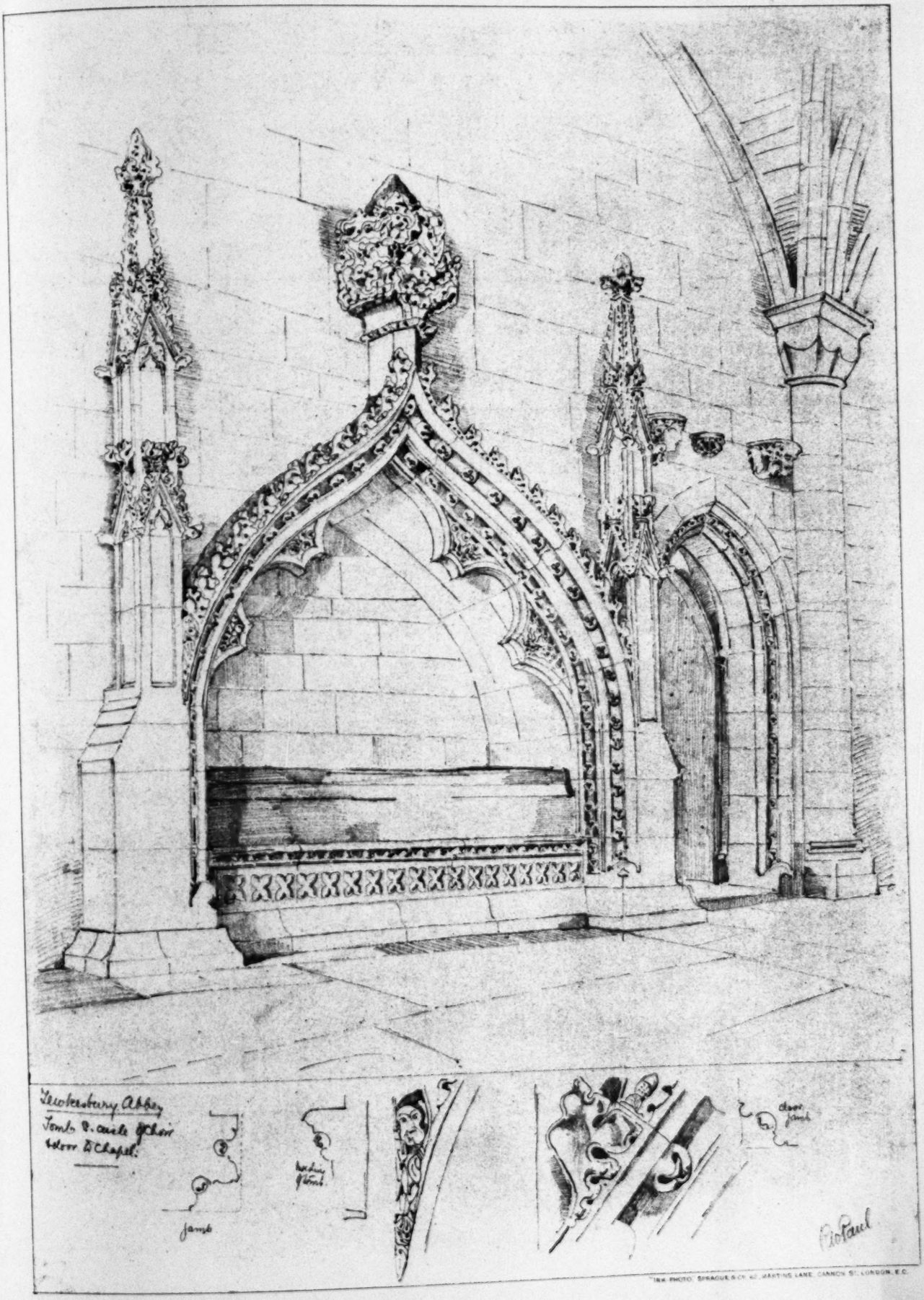

A SKETCH IN TEWKESBURY ABBEY, BY MR. ROWLAND W. PAUL.

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MISSION CHURCH, MOSBOROUGH.—Mr. John D. Webster, F.R.I.B.A., Architect.

Wyman & Sons Photo-Litho

C.A. Queen St. London. W.C.

CONGREGATIONAL CHURCH, WOODFORD.—Mr. Thomas Arnold, A.R.I.B.A., Architect.

HOUSE DRAINAGE IN LONDON.

ON the 4th inst. a paper was read before a well-attended meeting of the Association of Public Sanitary Inspectors at the rooms, Adam-street, Adelphi, by Mr. W. Hearne (Paddington), on the subject of "House Drains," Mr. Jerram, C.E., presiding.

The lecturer, believing it to be as important for the inspector to be equally conversant with the laws under which he works as with the principles of his work itself, opened by quoting some of the chief clauses in the Metropolis Local Management Act (1855) and the Metropolis Local Management Act (1862), which deal with house drainage in London. The powers under these Acts appeared to be as full as those given later to other urban districts by the Public Health Act (1875), and it was not easy at first to see why, the clauses in each Act being similar, we could not deal with the subject as effectively within the Metropolis as outside. Some local authorities in London required such modern improvements as interceptors, ventilators, and improved forms of water-closets, and insisted on the right of supervision throughout, but others went no further than to prescribe stoneware pipes for the drains, without carrying the supervision beyond the sewer connexion. The greatest difficulties appeared to arise from the confused opinions generally held as to the existing law and as to the powers of the local authorities. Only last year an important Vestry held that it had not the power to compel a supply of water to be laid on to closets. He thought the abstracts he had read from the two Acts referred to showed clearly that the legislation had given ample powers to the local authorities of London, and he questioned whether greater powers would now be given. The cry for more legislation was calculated to retard instead of to advance the work, and if only half as much energy were used in calling the attention of the people to its duties under existing statutes progress would be more real. The apathy of the householder and the fear of increased cost were the two great difficulties to be removed. With properly framed regulations the cost of effective supervision seldom exceed 1½ per cent. on the cost of buildings, and in many cases it would cost less to do the work properly than badly. Apathy was not so easy to overcome. Nothing short of death or illness in the family through bad drainage could rouse the average householder to a sense of importance of proper sanitary arrangements. The advantage of giving to local authorities full powers over new house drains could not be over-estimated. In the case of the entire absence of a drain or a water-closet there was not much room for dispute; but when it was a question as to the form of a closet, the jointing of pipes, or the provision of inlet and outlet shafts, it must be admitted that in the absence of regulations or uniformity of practice they had no power to reject appliances or stay the execution of work even when done upon principles condemned by all competent authorities years ago. Stanford's joints and others of the patented class were often deprived of the advantages looked for from their increased cost by the ignorance displayed in the jointing or laying. Good workmen trained in drain-laying were sometimes to be met with, but their number was small; and many an employer, with every desire to employ competent labour, could not obtain it. The lecturer, in conclusion, referred with approval to the action of the Plumbers' Company in endeavouring to secure good all-round work in the trade it represents, and suggested that if the Bricklayers' and Tylers' Company were to take similar action it would be doing a work which rightly belonged to it, whether it had or had not equal chances of success.

In the discussion which followed the reading of the paper, a large number of members took part, including Mr. S. C. Legg (Hon. Sec.), and Mr. E. Tidman, C.E., who, having been furnished with an abstract of Mr. Hearne's paper, had prepared written criticisms in reply.

Mr. Legg, who proposed the vote of thanks, pointed out the paralysing influence upon the efforts of all metropolitan inspectors of the total lack of "unity of administration" within its great area. The construction of new drains and the reconstruction of existing drains were, strange as it might appear, placed under the supervision of two totally distinct departments, and between the two it often happened that drains most carelessly constructed were covered up out of sight before they could be examined, either on account of a division of responsibility, or because there was no officer definitely directed to see to them; or, perhaps, because an officer who might be charged with the duty had too large a district to supervise. He regretted, on this account, that a measure which would have placed the supervision of all sanitary arrangements, whether for new houses or old ones, in the hand of the district inspector, had never become law. He referred to the suggested "Dwelling Houses Inspection Bill."

The resolution was seconded by Mr. Boulter (Bexley), and supported by Mr. Alexander (Shoreditch), and other inspectors.

Mr. E. Tidman, C.E., said it had always struck him as curious that London, the fountain-head of all legislation, should retain its old unreformed sanitary regulations, while others of a much more progressive character were in force in the provinces. He would like to see the "Model By-Laws" of the Local Government Board adopted in their entirety, with modifications such as recent sanitation had suggested, but he thought some improvement was possible without radical alterations in the existing laws. As surveyor to a Sanitary Association, it had been the speaker's duty to report on the drainage of a villa in the S.E. suburbs, in which there existed at least one dangerous feature, although it had been approved by the Surveyor to the Local Board. There was in the front garden an inlet ventilator, and at the back an outlet ventilator, a soil-pipe carried up the external wall. The smoke test showed, by the issue from the inlet ventilator of a strong volume of smoke, that children playing in the front garden would have under their noses the very sewer gas from which it had been the object of the ventilators to protect them. After some negotiation, he obtained the necessary consent for the indispensable alterations to be made, but was informed by the surveyor that in his district alone there were over 2,000 similar inlets. He got constructed nearer to the house a disconnecting syphon, and carried up the inlet to a point above the top of the highest window, but still 10 ft. lower than the orifice of the outlet-pipe, obtaining thereby a circulation of fresh air through the entire system, by which the sewer gases were carried off. He adopted the principle throughout, where drains had to be constructed or re-arranged under his inspection. The speaker was of opinion that not a foot of drain-pipe should be permitted to be covered up until inspected and approved by a competent and properly-paid officer. He agreed in the main in Mr. Hearne's views in regard to drainage plans, and he considered it essential that all sink and other connexions with house-drains should deliver over trapped gullies fixed outside where possible; that inlet and outlet air shafts should be provided to all house drains, the inlet never being less than 10 ft. above the ground-level; that no water-closet service pipe should ever connect directly with a cistern of drinking-water; and that flushing tanks, and for house drains, a syphon with an inspection-chamber, should be provided. Mr. Tidman concluded by reading an article from the *Builder* of Sept. 18th last, on "The Sanitary Condition of Chiswick," in which the important benefits accruing from efficient sanitary arrangements for the house were strikingly shown in a report of a house-to-house inspection recently made in Chiswick by Mr. Ramsden, Surveyor to the Local Board. The speaker thought they were doing much to educate the people, through the medium of their own publications, and the reports with which they were favoured by the public press when they met, as on that occasion, for the mutual communication of their experiences.

Messrs. Rains (St. George's, East), Dee (Wandsworth), Middleweek (Kensington), and Fairchild, having detailed their experiences, the chairman, Mr. Jerram, wound up the discussion, and Mr. Hearne having replied, a vote of thanks was unanimously accorded to him.

The Late Mr. Valliamy.—At this week's meeting of the Metropolitan Board of Works, the Works and General Purposes Committee will present a report recommending that the amount to be paid to the representatives of the late Superintending Architect, for services rendered, at the request of the Board, after the date of his resignation, and in respect of superannuation allowance, be 500*l*.

THE SOCIETY OF ENGINEERS.

THE thirty-second annual general meeting of the Society of Engineers was held on Monday evening last, in the reading-room of the society, Westminster-chambers. The chair was occupied by Mr. Perry F. Nursey, President.

The following gentlemen were balloted for and duly elected as the Council and officers for the ensuing year, viz.:—As President, Professor Henry Robinson; as Vice-Presidents, Mr. A. T. Walmisley, Mr. Arthur F. Phillips and Mr. M. Ogle Tarbotton; as Ordinary Members of Council, Messrs. J. R. Baillie, R. W. Peregrine Birch, W. Barns Kinsey, W. Schönheyder, Henry Adams, W. Newby Colam, Robert Harris, and Wm. Andrew Valon, the four latter gentlemen being new members of Council; as Honorary Secretary and Treasurer, Mr. Alfred Williams; and as Auditor, Mr. Alfred Lass.

The Victorian Engineers' Association having resolved "That all members of the Society of Engineers visiting Melbourne, on the presentation of letters of introduction from their secretary, shall be elected Honorary Members of the Association for six months," the following resolutions were passed unanimously:—

"That the Society of Engineers, being desirous of reciprocating the friendly action of the Victorian Engineers' Association, and not being able, under its rules, to elect Visitors as Honorary Members, hereby offers to Members of the Association visiting England, and duly introduced, a cordial invitation to attend all meetings and visits of the Society, and to enjoy all the privileges of membership (except voting and 'Transactions'), for six months."

"That the Secretary be instructed to forward a copy of the above resolution to the Victorian Engineers' Association."

The President announced that after the 25th of December the Society's Offices and Reading Rooms would be at 9, Victoria Chambers, S.W., and the proceedings were terminated by a general vote of thanks to the Council and officers for 1886, which was duly acknowledged by the chairman.

The annual dinner of the Society took place on Wednesday evening last, at the Guildhall Tavern, Gresham-street, Mr. Perry Fairfax Nursey, President, in the chair.

In proposing the toast of the evening, "Success to the Society," the chairman said that it was formed in 1854, and though a small body at first, they had added to their numbers year by year, until for some time past they had become thoroughly representative of the profession. Their society covered a very wide area, embracing not civil, mechanical, and electrical engineers alone, but every branch of engineering science and practice. They read papers and discussed them in a way which was not quite known in some institutions of a cognate character. They also visited during their vacation the chief engineering works of interest of the year, and under the presidency of Mr. Jabez Church they had inaugurated lectures for the junior members of the society. Another institution had done them the honour to imitate them in that respect, and had been enabled to carry on more perfectly than they could do the educational system which they had inaugurated and hoped to establish. They had endeavoured to constitute themselves an educational body, and they had hoped, in conjunction with the Institution of Civil Engineers, to have provided an examining and certificating body for the profession, but, unfortunately, the negotiations fell through, and they were left to themselves, but nevertheless they pursued their work steadily year by year.

Mr. Alfred Williams, honorary secretary and treasurer, responded, and observed that the society had affiliated itself to local societies of engineers in Victoria and New Zealand.

Mr. Charles Gandon proposed the toast of "The President," which was duly honoured.

The health of Professor Henry Robinson, the President-Elect, the Vice-Presidents, coupled with the name of Mr. Arthur T. Walmisley, and other toasts, followed.

New Buildings at the City End of the Thames Embankment.—Last week the new Guildhall School of Music was opened by the Lord Mayor; and this week the new buildings of Sion College were opened by H.R.H. the Prince of Wales. Of the first-named building (Sir Horace Jones, architect) we gave a view and plans in the *Builder* for Sept. 5, 1885; while of Sion College (Mr. A. W. Blomfield, M.A., architect) we gave a view some few years ago.

ARCHITECTURAL SOCIETIES.

Birmingham Architectural Association.—The third ordinary meeting of the current session was held at Queen's College on Tuesday evening, December 14th. Mr. F. B. Osborn (President) was in the chair. Mr. W. H. Bidlake, M.A. (Cantab), and Mr. E. J. Hickin, were nominated for membership. Mr. H. Thornhill Timmins was elected a member of the Association. A paper was read by Mr. Alfred Reading on "Venetian Architecture." The lecture was illustrated with some very fine lantern views. A vote of thanks, proposed by Mr. Victor Scruton (hon. sec.) and seconded by Mr. T. W. F. Newton, was accorded to Mr. Reading for his very interesting paper, and after a response from that gentleman the meeting terminated.

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COX AND ANOTHER *v.* PARDON & SONS AND THE GENERAL PUBLISHING COMPANY.

An application was made before Mr. Justice Stirling on Thursday last, on behalf of the plaintiffs, the proprietors of the *Builder*, for an injunction to restrain Messrs. Pardon & Sons, as the printers, and the General Publishing Company, as the publishers, of the *Brick, Tile, and Builders' Gazette*, from printing or publishing or selling any number of such last-named periodical containing any article, essay, note, or other matter copied or colourably altered from the *Builder*, or from otherwise infringing the plaintiffs' copyright.

Mr. Hadley, who appeared on behalf of the plaintiffs, stated that the defendants had not only caused extracts from the *Builder* from time to time to be inserted in the *Brick, Tile, and Builders' Gazette*, coupled with a notification that such extracts were taken from the *Builder*, but that they had repeatedly caused to be inserted, *verbatim*, articles from the *Builder* without any notification whatever as to the source from which such articles had been derived, and as though the same were original matter of the *Brick, Tile, and Builders' Gazette*.

The facts of the case having been proved, his Lordship granted an interim injunction as asked for by the plaintiffs.

Appointment of a Diocesan Surveyor. Mr. E. W. Farebrother, F.R.I.B.A., of Grimsby, has been elected a Diocesan Surveyor for the county of Lincoln.

LIGHT AND AIR.

HARRIS *v.* BROOKS.

In the Chancery Division of the High Court of Justice, the case of Harris *v.* Brooks was heard last week before Mr. Justice Kekewich.

Mr. Barber, Q.C., appeared for the plaintiff; and Mr. Cooper Willis, Q.C., for the defendant.

The case arose out of the rebuilding of the defendant's premises in Ship Tavern-passage, Leadenhall Market. It appeared that the original intention of the defendant was to have carried the new front wall of his premises 13 ft. higher than the old line, and as the plaintiff (who is the proprietor of the Swan Tavern, in Ship Tavern-passage) could not obtain any definite undertaking from the defendant that this proposed increase in height would be reduced so as not to injure the plaintiff's rights of light, he applied for and obtained an injunction. The defendant subsequently completed his building, finishing the front wall 2 ft. 4 in. above the old line, and substituting a curb roof for the originally-intended upper story. There was also another point raised in the pleadings with respect to the obstruction of light to an attic window of the plaintiff's premises, in front of which the defendant had raised the roof of his new building, leaving only a "hopper" or small area round the building.

The hearing of the case lasted nearly four days.

The defendant sought to show that the plaintiff had not been justified in applying for the injunction in the face of certain letters which he had previously received from the defendant's architect (Mr. E. B. l'Anson) and solicitors. He also contended that the attic window was not an ancient light, alleging that it had formerly been fitted with shutters, which, when the attic was not in use, had been closed, and that, therefore, there had been no continuous user or enjoyment within the meaning of the Act.

A number of witnesses were called to support and refute these statements, and the evidence was somewhat conflicting. As to the damage which the light in the plaintiff's premises had or had not sustained by the raising of the front wall of the defendant's premises, several professional witnesses were called. Mr. Seth Payne and Mr. Sextus Dyball on behalf of the plaintiff, and Mr. E. l'Anson, P.R.I.B.A., Mr. E. B. l'Anson, Mr. E. A. Grüning, and Mr. Curtis on behalf of the defendant. Mr. Payne and Mr. Dyball stated it as their opinion that, taking into consideration the narrowness of the passage and the height of the buildings on either side, the raising of the front wall of the defendant's premises must result in a loss of skyline, and a consequent diminution of light to the bar of the plaintiff's premises, also that the light to the attic window had been seriously obstructed. Messrs. l'Anson, Grüning, and Curtis, on the other hand, maintained that the bar depended for light to a great extent upon skylights, and that the raising of the opposite premises could in no way affect the light, which could only be derived in a vertical direction. As an example of the difference of opinion which is frequently so apparent among professional witnesses, Mr. Grüning stated that he considered that had the defendant raised his wall 50 ft. above the old line the plaintiff's light would not have been materially injured.

Mr. Justice Kekewich, in giving judgment for the plaintiff, with costs, stated that with regard to the attic window, the plaintiff had fully made out his case as to its being an ancient light within the meaning of the Act; further, that he considered its light had been affected by the roof of the defendant's new building, and in this respect he awarded 15*l.* damages to the plaintiff, to defray the cost of providing additional light to the attic to compensate for that of which it had been deprived. As to the injunction, the learned judge stated that no amount of expert evidence would tend to convince him that the projected raising of the front wall of the defendant's premises would not have damaged the light enjoyed by the plaintiff's bar, and that therefore the plaintiff was perfectly justified in applying for the injunction, notwithstanding the letters which he at the time received from defendant's architect and solicitors, informing him that his rights would be respected, as these letters gave no drawing or undertaking showing to what height it was intended the defendant's building should be carried up.—*Communicated.*

A DISPUTE AS TO STONE-CUTTING MACHINES.

HALL *v.* BURKE.

This case, which was reported in the *Builder* for March 27 last, p. 489, has recently been before the Court of Appeal. The facts are briefly these:—Early in the present year, Messrs. Hall & Co., engineers, of Burley, near Leeds, brought an action against Messrs. Burke & Co., mosaic manufacturers and marble merchants, of Newman-street, London, and of Paris and Venice, for the value of certain machines supplied to the defendants' order. The defendants,—or, more correctly, the defendant,—is well known as the manufacturer of mosaic tesseræ, produced by a special process from a combination of granite or marble and certain other materials. For the purposes of this work he ordered from the

plaintiffs three horizontal machines on the pendulum principle, from drawings and plans supplied by himself. The machines were in due course delivered, but, on the question of payment arising, considerable conflict ensued between the parties, and an action at law followed. The defendant demurred to paying for one or two of the machines, on the ground of alleged defects in construction, which led to a failure to work. From the plaintiffs' case it seemed that they had understood that the machines were intended for cutting ordinary building stone, and they contended, first, that saw-frames for marble-cutting ought to be made stronger than those for building-stone; and next, that the crank and not the pendulum principle should have been adopted. And, further, they argued that however that might be, as they had worked, not upon their own designs, but upon plans and drawings furnished by the defendant, they were simply his agents, and were not responsible for the failure, the work having been skilfully executed. Besides the claim for the machines, the plaintiffs also claimed an amount for certain extra work which they said had been imposed upon them during the construction of the machines. On the other hand, Mr. Burke made a counter claim for 3,000*l.* or 4,000*l.*, on the plea of loss through the inefficient machinery supplied. The plaintiffs' claim amounted to between 800*l.* and 900*l.* The trial, in the first instance, occupied ten or eleven days, during which several eminent experts were examined on each side, and eventually Mr. Justice Grantham decided that the plaintiffs had only acted as the defendants' engineers or servants, inasmuch as he supplied the drawings, and introduced a sand-box and other arrangements of his own design; that the breakage was largely due to the cramping of the details rendered necessary by the limited space for the machine in Paris; and that the defendant had adopted the wrong principle. On all these grounds he decided against the counter claim, and pronounced for the plaintiffs' claim,—slightly reduced.

Against this judgment Mr. Burke appealed, and after a further trial of five or six days the decision of the higher Court has just been delivered. Mr. Burke conducted his own case, and the Court complimented him upon the skill and ability he displayed. The Master of the Rolls described the various forms of contract in such matters. First there was the contract under which a manufacturer simply made machines to the order and on the plans of the customer, and accepted no responsibility beyond putting in proper work. Then there was the contract under which a manufacturer undertook to supply a machine for a specified purpose, and upon his own design and invention,—and such a contract implied a guarantee that the machine should be fit and proper for the purpose. Again, there might be an agreement between the parties that each would do his best, and they should try jointly to produce the machine required,—and in that case there would be no implied guarantee. In the case now under consideration there was, however, a contract in writing, under which the plaintiffs were to make a machine as stated in the letters, and in the view of the Court the usual guarantee to make a fit and suitable machine was thereby implied. Thus the question of liability for the failure of the Paris machine was decided against the plaintiffs, and the previous decision reversed. Then with regard to the point of additional charges for extra work, it was true that the defendant had during the construction made certain suggestions, in the form of orders, and the plaintiffs would have been within their right in declining to adopt these suggestions, except on the condition of being exempt from the guarantee, and being paid for the extra work. That would have constituted a new contract, but that was not done in this instance, and the conclusions at which the Court arrived were these. It was clear from the evidence that the Paris machine had broken down, and as the manufacturers had adopted the defendant's suggestions, the plea that his sand-box had caused the failure would not stand. The plaintiffs were therefore responsible. It was held by the plaintiffs that the defendant had kept the machine so long in Paris that he must be taken to have accepted the machine, and could not now reject it; but the Court did not take that view, but decided that the plaintiffs having failed with their machine, they must take it back, and also repay to Mr. Burke the cost of carriage to Paris, the machine delivered not having been according to contract. As to the other two machines which were not taken to Paris, with regard to one, the Court could find no substantial defects in it, and the defendant must accept it; and as to the other, he had kept it an unreasonable time, and must, therefore, be held to have accepted that also. The plaintiffs having succeeded in the greater part of their claim, they were entitled to the general costs of the action; but both parties having fought out the case in respect to the whole matter, and both having won and lost considerably, no costs would be allowed to either on the appeal.

The result of the whole matter is that the plaintiffs gain payment for two machines, but bear their own costs on appeal, while the defendant saves the price of the Paris machine, about 102*l.*, plus the cost of carriage, but he has also to pay the general costs, and his own costs on the appeal.

EMBATTLED GABLES.

SIR,—Your correspondent, "A. H.," in your issue of the 4th inst. [p. 825], asks a question as to the origin of embattled gables, such as were shown in my little sketch of St. Jans Gasthuis, which you reproduced on p. 768.

The form is very common in the Low Countries, though not peculiar to them, as examples, varying in style and design, may be seen in most European countries, and I think it can hardly be attributed to Spanish influences, but is rather a development of the embattled parapet. There is a house at Tournai, illustrated in "Gwilt's Encyclopædia," p. 243, which shows a combination of the embattled wall and stepped gable, and many walls of Venetian palaces are finished with small brick gablets or pinnacles bearing a great resemblance to the roof gables of Holland. This, however, is only fanciful, and a careful examination of Dutch work would seem to point to the common-sense reason, that the stepped gable was used so frequently because it was easier to arrange the bricks in regular breaks than to chamfer each one to the line of the roof angle; and in cases where, for ornament or some constructive reason, it was thought necessary to bring the gable nearer the triangular form, the spaces as the sets-off were filled in with scroll-work or figures.

The brick-coped gable is pretty common, taking the rake of the roof as the first set-off, and it usually has a solid piece of brickwork at the apex corresponding to the upper "merlon" of a regular embattled gable. This would seem to be a more modern form than the other, though I have no accurate information on this point.

Beyond the reasons given above, there are artistic advantages in the use of this embattled form which the old Dutch builders were fully alive to, as this, more than any other kind of gable, helps to preserve that horizontality so characteristic of the North Holland buildings. The strings dividing the wall space are repeated in the gable and returned on the steps, which are usually from 7½ in. to 9 in. thick.

F. T. W. GOLDSMITH.

CHIMNEY-SHAFT FOR "DESTRUCTOR."

SIR,—Will you kindly allow me to ask readers of your journal if any of them will give me particulars of the size to build a chimney-shaft to carry off the fumes from a "Destructor furnace" for burning town refuse?

Perhaps the Messrs. Bancroft, who are authorities on the subject of tall chimney construction, would favour me with some information respecting these shafts.

C. I.

PROVINCIAL NEWS.

Bexhill-on-Sea.—The sewerage works for Bexhill-on-Sea were commenced in the early part of March last, the tender of Mr. James Hayward, contractor, of Eastbourne, amounting to 5,477*l.*, being accepted. They have recently been completed at a cost of 5,581*l.*, which is within the engineer's estimate. The whole of the work has been carried out from the plans and under the superintendence of Mr. H. Bertram Nichols, Assoc. M. Inst. C.E., whose scheme was selected by the Local Board as being the best and most suitable for their district, out of several candidates who competed for the appointment last year. The total expenditure by the Board has amounted to about 7,500*l.*, which includes engineering charges, compensation, and use of main outfall sewer, &c. The work has been carried out within the specified time. The duties of clerk of works was undertaken by Mr. J. Downsborough, of Bexhill. The scheme embraces Bexhill and the village of Sidley, and has been designed upon the separate system, the bulk of the rainfall being allowed to pass away through the existing channels. Manholes are constructed at every change of lateral deviation, the whole of the sewers being in straight lines with even gradients, having manholes, lampholes, or ventilators at every change of vertical deviation. The length of the sewers is about five miles 1,000 yards, the greater portion being of stoneware pipes 9 in., 12 in., 15 in., and 18 in. in diameter. A considerable length are of "Hassall's patent safety pipes," this joint being used for the steep gradients, and where it has been necessary to ensure a safe and watertight joint. The remainder of the pipes are of Doulton's London manufacture. The ventilation is effected by numerous openings in the roadway, in connexion with the manholes and lampholes, having dirt-boxes combined with the covers, numbering 115 permanent openings on the whole system. A slight drop is allowed at each manhole, and flap valves are inserted, breaking the sewers into short lengths, whereby each section ventilates itself. By this means the sewer air is prevented from rising into the higher portions of the district, which are additionally ventilated by cast-iron shafts carried up above the houses, surmounted with Gibb's weatherproof extractors. Sliding disc flushing-valves are placed in the manholes for the purpose of flushing the sewers with the ordinary flow of the sewage. In addition to this, automatic flushing-tanks are placed at the dead ends of the sewers, fitted with Doulton's annular syphon, capable of discharging about 600 gallons at each flush. An interesting feature in the scheme is the construction of a large flushing-tank on the main sewer in connexion with a stream, having a capacity of about 1,600 gallons, which is capable of discharging its contents in the short space of a minute and a half. The tank is fitted with valve-chamber, penstock, and overflow, and has a 9-in. outlet to the main sewer. The main outfall sewer is ovate in section, 2 ft. 6 in. by 1 ft. 8 in., and connects on to the main sewer along the new esplanade, constructed by Earl de la Warr, for the Bexhlil estate, passing into outfall tanks, and from thence out to sea in cast-iron pipes.

Edgbaston (Birmingham).—The new Vestry-hall and offices for the parish of Edgbaston are now ready for occupation The new premises, situate at the corner of New Bridge-street and Enfield-place, Islington-row, have been built in consequence of the Midland Railway Company having acquired the old Vestry-hall in Enfield-place, which they have since converted into offices for the Five Ways Railway-station. The new buildings are in the Early Elizabethan style, adapted to modern requirements. The architects are Messrs. Osborn & Reading, of Bennett's-hill. The elevations are of red brick, with red Beggar's Well stone dressings. The contractor is Mr. John Bowen, of Balsall Heath.

CHURCH-BUILDING NEWS.

Newby-in-Cleveland.—A Church of England School and Mission Church at the village of Newby-in-Cleveland, in the parish of Stokesley, was opened last week. The drawings for the building, which were prepared by Mr. John W. Alexander, Diocesan Surveyor for York, have been approved by the Education Department. The brickwork, slating, &c., was executed by Mr. Adam White, of Guisborough; the joinery work by Mr. John Harbottle, of Great Ayton; and the plumbing and painting by Mr. Jonathan Rowlands, of Yarm.

Swansea.—Llanvnewydd Church, Penclawdd, was reopened for divine service by the Ven. Archdeacon James on the 9th inst. The building has been thoroughly restored, the stone spire taken entirely down and rebuilt, it having been found to be in a dangerous state of decay; the belfry windows and stonework of the tower replaced, the entrance archway fitted with an oak door, the whole of the windows reglazed with cathedral glass, and the walls and ceiling re-plastered and coloured. The walls outside are carefully pointed in Aberthaw mortar; the church heated by Mr. Porritt's system; and an eagle lectern placed in the chancel. The work has been executed by Messrs. Thomas Watkins & Jenkins, of Swansea, from the designs and under the superintendence of Mr. J. Buckley Wilson.

Withnell.—The Church of St. Paul was reopened on the 5th inst., after internal alterations. The old box pews at the eastern end of the church have been replaced with new open benches. A new reading-desk has been provided, and the existing pulpit reduced in height. The aisles are paved with polished flags. At the west end of the building an interior porch has been erected. The contractor was Mr. J. Pearson, of Manchester, and the architect Mr. Henry Ross, of Accrington.

STAINED GLASS.

Morhanger (near Bedford).—A Munich stained-glass window has just been erected in the Church of Morhanger, near Bedford. It represents "The Angel at the Tomb," and a brass underneath records the fact that it is in memory of Mr. H. Thornton. This is the third window in the church executed by the same artists, Messrs. Mayer & Co.

Paddington.—New stonework and a very large stained glass window have been put up at the west end of St. John's Church, Oxford-square, Paddington. The window illustrates the life of

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COX AND ANOTHER *v.* PARDON & SONS AND THE GENERAL PUBLISHING COMPANY.

An application was made before Mr. Justice Stirling on Thursday last, on behalf of the plaintiffs, the proprietors of the *Builder*, for an injunction to restrain Messrs. Pardon & Sons, as the printers, and the General Publishing Company, as the publishers, of the *Brick, Tile, and Builders' Gazette*, from printing or publishing or selling any number of such last-named periodical containing any article, essay, note, or other matter copied or colourably altered from the *Builder*, or from otherwise infringing the plaintiffs' copyright.

Mr. Hadley, who appeared on behalf of the plaintiffs, stated that the defendants had not only caused extracts from the *Builder* from time to time to be inserted in the *Brick, Tile, and Builders' Gazette*, coupled with a notification that such extracts were taken from the *Builder*, but that they had repeatedly caused to be inserted, *verbatim*, articles from the *Builder* without any notification whatever as to the source from which such articles had been derived, and as though the same were original matter of the *Brick, Tile, and Builders' Gazette*.

The facts of the case having been proved, his Lordship granted an interim injunction as asked for by the plaintiffs.

Appointment of a Diocesan Surveyor. Mr. E. W. Farebrother, F.R.I.B.A., of Grimsby, has been elected a Diocesan Surveyor for the county of Lincoln.

LIGHT AND AIR.

HARRIS *v.* BROOKS.

In the Chancery Division of the High Court of Justice, the case of Harris *v.* Brooks was heard last week before Mr. Justice Kekewich.

Mr. Barber, Q.C., appeared for the plaintiff; and Mr. Cooper Willis, Q.C., for the defendant.

The case arose out of the rebuilding of the defendant's premises in Ship Tavern-passage, Leadenhall Market. It appeared that the original intention of the defendant was to have carried the new front wall of his premises 13 ft. higher than the old line, and as the plaintiff (who is the proprietor of the Swan Tavern, in Ship Tavern-passage) could not obtain any definite undertaking from the defendant that this proposed increase in height would be reduced so as not to injure the plaintiff's rights of light, he applied for and obtained an injunction. The defendant subsequently completed his building, finishing the front wall 2 ft. 4 in. above the old line, and substituting a curb roof for the originally-intended upper story. There was also another point raised in the pleadings with respect to the obstruction of light to an attic window of the plaintiff's premises, in front of which the defendant had raised the roof of his new building, leaving only a "hopper" or small area round the building.

The hearing of the case lasted nearly four days.

The defendant sought to show that the plaintiff had not been justified in applying for the injunction in the face of certain letters which he had previously received from the defendant's architect (Mr. E. B. I'Anson) and solicitors. He also contended that the attic window was not an ancient light, alleging that it had formerly been fitted with shutters, which, when the attic was not in use, had been closed, and that, therefore, there had been no continuous user or enjoyment within the meaning of the Act.

A number of witnesses were called to support and refute these statements, and the evidence was somewhat conflicting. As to the damage which the light in the plaintiff's premises had or had not sustained by the raising of the front wall of the defendant's premises, several professional witnesses were called. Mr. Seth Payne and Mr. Sextus Dyball on behalf of the plaintiff, and Mr. E. I'Anson, P.R.I.B.A., Mr. E. B. I'Anson, Mr. E. A. Grüning, and Mr. Curtis on behalf of the defendant. Mr. Payne and Mr. Dyball stated it as their opinion that, taking into consideration the narrowness of the passage and the height of the buildings on either side, the raising of the front wall of the defendant's premises must result in a loss of skyline, and a consequent diminution of light to the bar of the plaintiff's premises, also that the light to the attic window had been seriously obstructed. Messrs. I'Anson, Grüning, and Curtis, on the other hand, maintained that the bar depended for light to a great extent upon skylights, and that the raising of the opposite premises could in no way affect the light, which could only be derived in a vertical direction. As an example of the difference of opinion which is frequently so apparent among professional witnesses, Mr. Grüning stated that he considered that had the defendant raised his wall 50 ft. above the old line the plaintiff's light would not have been materially injured.

Mr. Justice Kekewich, in giving judgment for the plaintiff, with costs, stated that with regard to the attic window, the plaintiff had fully made out his case as to its being an ancient light within the meaning of the Act; further, that he considered its light had been affected by the roof of the defendant's new building, and in this respect he awarded 15*l.* damages to the plaintiff, to defray the cost of providing additional light to the attic to compensate for that of which it had been deprived. As to the injunction, the learned judge stated that no amount of expert evidence would tend to convince him that the projected raising of the front wall of the defendant's premises would not have damaged the light enjoyed by the plaintiff's bar, and that therefore the plaintiff was perfectly justified in applying for the injunction, notwithstanding the letters which he at the time received from defendant's architect and solicitors, informing him that his rights would be respected, as these letters gave no drawing or undertaking showing to what height it was intended the defendant's building should be carried up.—*Communicated.*

A DISPUTE AS TO STONE-CUTTING MACHINES.

HALL *v.* BURKE.

This case, which was reported in the *Builder* for March 27 last, p. 489, has recently been before the Court of Appeal. The facts are briefly these:—Early in the present year, Messrs. Hall & Co., engineers, of Burley, near Leeds, brought an action against Messrs. Burke & Co., mosaic manufacturers and marble merchants, of Newman-street, London, and of Paris and Venice, for the value of certain machines supplied to the defendants' order. The defendants,—or, more correctly, the defendant,—is well known as the manufacturer of mosaic tesseræ, produced by a special process from a combination of granite or marble and certain other materials. For the purposes of this work he ordered from the

plaintiffs three horizontal machines on the pendulum principle, from drawings and plans supplied by himself. The machines were in due course delivered, but, on the question of payment arising, considerable conflict ensued between the parties, and an action at law followed. The defendant demurred to paying for one or two of the machines, on the ground of alleged defects in construction, which led to a failure to work. From the plaintiffs' case it seemed that they had understood that the machines were intended for cutting ordinary building stone, and they contended, first, that saw-frames for marble-cutting ought to be made stronger than those for building-stone; and next, that the crank and not the pendulum principle should have been adopted. And, further, they argued that however that might be, as they had worked, not upon their own designs, but upon plans and drawings furnished by the defendant, they were simply his agents, and were not responsible for the failure, the work having been skilfully executed. Besides the claim for the machines, the plaintiffs also claimed an amount for certain extra work which they said had been imposed upon them during the construction of the machines. On the other hand, Mr. Burke made a counter claim for 3,000*l.* or 4,000*l.*, on the plea of loss through the inefficient machinery supplied. The plaintiffs' claim amounted to between 800*l.* and 900*l.* The trial, in the first instance, occupied ten or eleven days, during which several eminent experts were examined on each side, and eventually Mr. Justice Grantham decided that the plaintiffs had only acted as the defendants' engineers or servants, inasmuch as he supplied the drawings, and introduced a sand-box and other arrangements of his own design; that the breakage was largely due to the cramping of the details rendered necessary by the limited space for the machine in Paris; and that the defendant had adopted the wrong principle. On all these grounds he decided against the counter claim, and pronounced for the plaintiffs' claim,—slightly reduced.

Against this judgment Mr. Burke appealed, and after a further trial of five or six days the decision of the higher Court has just been delivered. Mr. Burke conducted his own case, and the Court complimented him upon the skill and ability he displayed. The Master of the Rolls described the various forms of contract in such matters. First there was the contract under which a manufacturer simply made machines to the order and on the plans of the customer, and accepted no responsibility beyond putting in proper work. Then there was the contract under which a manufacturer undertook to supply a machine for a specified purpose, and upon his own design and invention,—and such a contract implied a guarantee that the machine should be fit and proper for the purpose. Again, there might be an agreement between the parties that each would do his best, and they should try jointly to produce the machine required,—and in that case there would be no implied guarantee. In the case now under consideration there was, however, a contract in writing, under which the plaintiffs were to make a machine as stated in the letters, and in the view of the Court the usual guarantee to make a fit and suitable machine was thereby implied. Thus the question of liability for the failure of the Paris machine was decided against the plaintiffs, and the previous decision reversed. Then with regard to the point of additional charges for extra work, it was true that the defendant had during the construction made certain suggestions, in the form of orders, and the plaintiffs would have been within their right in declining to adopt these suggestions, except on the condition of being exempt from the guarantee, and being paid for the extra work. That would have constituted a new contract, but that was not done in this instance, and the conclusions at which the Court arrived were these. It was clear from the evidence that the Paris machine had broken down, and as the manufacturers had adopted the defendant's suggestions, the plea that his sand-box had caused the failure would not stand. The plaintiffs were therefore responsible. It was held by the plaintiffs that the defendant had kept the machine so long in Paris that he must be taken to have accepted the machine, and could not now reject it; but the Court did not take that view, but decided that the plaintiffs having failed with their machine, they must take it back, and also repay to Mr. Burke the cost of carriage to Paris, the machine delivered not having been according to contract. As to the other two machines which were not taken to Paris, with regard to one, the Court could find no substantial defects in it, and the defendant must accept it; and as to the other, he had kept it an unreasonable time, and must, therefore, be held to have accepted that also. The plaintiffs having succeeded in the greater part of their claim, they were entitled to the general costs of the action; but both parties having fought out the case in respect to the whole matter, and both having won and lost considerably, no costs would be allowed to either on the appeal.

The result of the whole matter is that the plaintiffs gain payment for two machines, but bear their own costs on appeal, while the defendant saves the price of the Paris machine, about 102*l.*, plus the cost of carriage, but he has also to pay the general costs, and his own costs on the appeal.

EMBATTLED GABLES.

Sir,—Your correspondent, "A. H.," in your issue of the 4th inst. [p. 825], asks a question as to the origin of embattled gables, such as were shown in my little sketch of St. Jans Gasthuis, which you reproduced on p. 768.

The form is very common in the Low Countries, though not peculiar to them, as examples, varying in style and design, may be seen in most European countries, and I think it can hardly be attributed to Spanish influences, but is rather a development of the embattled parapet. There is a house at Tournai, illustrated in "Gwilt's Encyclopædia," p. 243, which shows a combination of the embattled wall and stepped gable, and many walls of Venetian palaces are finished with small brick gablets or pinnacles bearing a great resemblance to the roof gables of Holland. This, however, is only fanciful, and a careful examination of Dutch work would seem to point to the common-sense reason, that the stepped gable was used so frequently because it was easier to arrange the bricks in regular breaks than to chamfer each one to the line of the roof angle; and in cases where, for ornament or some constructive reason, it was thought necessary to bring the gable nearer the triangular form, the spaces as the sets-off were filled in with scroll-work or figures.

The brick-coped gable is pretty common, taking the rake of the roof as the first set-off, and it usually has a solid piece of brickwork at the apex corresponding to the upper "merlon" of a regular embattled gable. This would seem to be a more modern form than the other, though I have no accurate information on this point.

Beyond the reasons given above, there are artistic advantages in the use of this embattled form which the old Dutch builders were fully alive to, as this, more than any other kind of gable, helps to preserve that horizontality so characteristic of the North Holland buildings. The strings dividing the wall space are repeated in the gable and returned on the steps, which are usually from 7½ in. to 9 in. thick.

F. T. W. Goldsmith.

CHIMNEY-SHAFT FOR "DESTRUCTOR."

Sir,—Will you kindly allow me to ask readers of your journal if any of them will give me particulars of the size to build a chimney-shaft to carry off the fumes from a "Destructor furnace" for burning town refuse?

Perhaps the Messrs. Bancroft, who are authorities on the subject of tall chimney construction, would favour me with some information respecting these shafts.

C. I.

PROVINCIAL NEWS.

Bexhill-on-Sea.—The sewerage works for Bexhill-on-Sea were commenced in the early part of March last, the tender of Mr. James Hayward, contractor, of Eastbourne, amounting to 5,477*l.*, being accepted. They have recently been completed at a cost of 5,581*l.*, which is within the engineer's estimate. The whole of the work has been carried out from the plans and under the superintendence of Mr. H. Bertram Nichols, Assoc. M. Inst. C.E., whose scheme was selected by the Local Board as being the best and most suitable for their district, out of several candidates who competed for the appointment last year. The total expenditure by the Board has amounted to about 7,500*l.*, which includes engineering charges, compensation, and use of main outfall sewer, &c. The work has been carried out within the specified time. The duties of clerk of works was undertaken by Mr. J. Downsborough, of Bexhill. The scheme embraces Bexhill and the village of Sidley, and has been designed upon the separate system, the bulk of the rainfall being allowed to pass away through the existing channels. Manholes are constructed at every change of lateral deviation, the whole of the sewers being in straight lines with even gradients, having manholes, lampholes, or ventilators at every change of vertical deviation. The length of the sewers is about five miles 1,000 yards, the greater portion being of stoneware pipes 9 in., 12 in., 15 in., and 18 in. in diameter. A considerable length are of "Hassall's patent safety pipes," this joint being used for the steep gradients, and where it has been necessary to ensure a safe and watertight joint. The remainder of the pipes are of Doulton's London manufacture. The ventilation is effected by numerous openings in the roadway, in connexion with the manholes and lampholes, having dirt-boxes combined with the covers, numbering 115 permanent openings on the whole system. A slight drop is allowed at each manhole, and flap valves are inserted, breaking the sewers into short lengths, whereby each section ventilates itself. By this means the sewer air is prevented from rising into the higher portions of the district, which are additionally ventilated by cast-iron shafts carried up above the houses, surmounted with Gibb's weatherproof extractors. Sliding disc flushing-valves are placed in the manholes for the purpose of flushing the sewers with the ordinary flow of the sewage. In addition to this, automatic flushing-tanks are placed at the dead ends of the sewers, fitted with Doulton's annular syphon, capable of discharging about 600 gallons at each flush. An interesting feature in the scheme is the construction of a large flushing-tank on the main sewer in connexion with a stream, having a capacity of about 1,600 gallons, which is capable of discharging its contents in the short space of a minute and a half. The tank is fitted with valve-chamber, penstock, and overflow, and has a 9-in. outlet to the main sewer. The main outfall sewer is ovate in section, 2 ft. 6 in. by 1 ft. 8 in., and connects on to the main sewer along the new esplanade, constructed by Earl de la Warr, for the Bexhill estate, passing into outfall tanks, and from thence out to sea in cast-iron pipes.

Edgbaston (*Birmingham*).—The new Vestry-hall and offices for the parish of Edgbaston are now ready for occupation. The new premises, situate at the corner of New Bridge-street and Enfield-place, Islington-row, have been built in consequence of the Midland Railway Company having acquired the old Vestry-hall in Enfield-place, which they have since converted into offices for the Five Ways Railway-station. The new buildings are in the Early Elizabethan style, adapted to modern requirements. The architects are Messrs. Osborn & Reading, of Bennett's-hill. The elevations are of red brick, with red Beggar's Well stone dressings. The contractor is Mr. John Bowen, of Balsall Heath.

CHURCH-BUILDING NEWS.

Newby-in-Cleveland.—A Church of England School and Mission Church at the village of Newby-in-Cleveland, in the parish of Stokesley, was opened last week. The drawings for the building, which were prepared by Mr. John W. Alexander, Diocesan Surveyor for York, have been approved by the Education Department. The brickwork, slating, &c., was executed by Mr. Adam White, of Guisborough; the joinery work by Mr. John Harbottle, of Great Ayton; and the plumbing and painting by Mr. Jonathan Rowlands, of Yarm.

Swansea.—Llanvnewydd Church, Penclawdd, was reopened for divine service by the Ven. Archdeacon James on the 9th inst. The building has been thoroughly restored, the stone spire taken entirely down and rebuilt, it having been found to be in a dangerous state of decay; the belfry windows and stonework of the tower replaced, the entrance archway fitted with an oak door, the whole of the windows reglazed with cathedral glass, and the walls and ceiling re-plastered and coloured. The walls outside are carefully pointed in Aberthaw mortar; the church heated by Mr. Porritt's system; and an eagle lectern placed in the chancel. The work has been executed by Messrs. Thomas Watkins & Jenkins, of Swansea, from the designs and under the superintendence of Mr. J. Buckley Wilson.

Withnell.—The Church of St. Paul was reopened on the 5th inst., after internal alterations. The old box pews at the eastern end of the church have been replaced with new open benches. A new reading-desk has been provided, and the existing pulpit reduced in height. The aisles are paved with polished flags. At the west end of the building an interior porch has been erected. The contractor was Mr. J. Pearson, of Manchester, and the architect Mr. Henry Ross, of Accrington.

STAINED GLASS.

Morhanger (*near Bedford*).—A Munich stained-glass window has just been erected in the Church of Morhanger, near Bedford. It represents "The Angel at the Tomb," and a brass underneath records the fact that it is in memory of Mr. H. Thornton. This is the third window in the church executed by the same artists, Messrs. Mayer & Co.

Paddington.—New stonework and a very large stained glass window have been put up at the west end of St. John's Church, Oxford-square, Paddington. The window illustrates the life of

Joseph, in six subjects, arranged in the following order:—1. Joseph sold by his Brethren. 2. Joseph interpreting Pharaoh's Dream. 3. Joseph accuses his Brethren of being Spies. 4. Joseph maketh himself known to his Brethren. 5. Joseph meeteth his Father Jacob. 6. Jacob blessing the Sons of Joseph. This window is erected by the parishioners and friends to the memory of Mr. John Bonhote, Mary Bonhote, and Cecil Moore, late curate of the parish. The new stonework was designed by Mr. A. W. Blomfield, and Messrs. Heaton, Butler, & Bayne designed and executed the glass at their studios in Garrick-street.

The Student's Column.

STONE QUARRIES.—XXV.

SANDSTONES (*continued*).

WITH the exception of some large and important quarries to the north and north-east of Beaumaris, and a few scattered workings here and there, in carboniferous beds, limestones are not raised in *Wales*. But sandstones are, and in some instances have found their way into the London market. One of the principal of these is that obtained from the

Quarella Quarry, near Bridgend, in Glamorganshire. The first historical record of the quarrying of this stone dates from the time of Elizabeth; and, although the material is now extensively raised, it is interesting to note that the old quarry has not apparently been disturbed since that time, the newer workings having been commenced on the slope of a hill running down to the river Ogmore, and 200 yards or more distant from the old quarry. On a recent visit, curiosity tempted us to go into the latter, where we found large trees had grown in a clay soil which had fallen from the upper part of the working. The old blocks of stone were covered with moss, in spite of the fact that the stone had not sufficiently decayed to afford a good hold to the roots!

The new quarry may be described as a trench about 300 ft. long, 60 ft. broad, and 40 ft. deep, in the Millstone Grit formation. The stone is raised from the bottom and put into trucks by means of a steam travelling gantry, which runs on ways supported by massive beams of timber, parallel to the face of the quarry. A siding from the Great Western Railway contributes materially to the ready transport of the stone. Of the latter there are six kinds, all having more or less a greenish tint. There are only three beds, known respectively as "grey," "green," and "white," specially worked for building purposes, and of these the green and white are decidedly the superior, being used for dressings both inside and out, pulpits, &c., the grey supplying good steps and landings. The stone known as the "top rock" is used for shoddies, quoins, and wall-stones. One bed is known as the "grindstone rock," from the fact that those implements are made therefrom, whilst another is called the "holystone bed."

Microscopically, the stone from the green bed is less compact than that from the white, whilst both show that, in addition to having a considerable proportion of silica disseminated throughout the grains of sand, the stone is highly compressed. Occasionally small siliceous concretions appear, but as they are firmly fixed in the surrounding material they do not detract in the slightest from the durability of the stone. Neither are these bodies sufficiently numerous to deserve more than a passing notice. Unquestionably the stone is very durable, and this fact should commend it to the notice of those who are seeking desirable materials with which to construct edifices in the metropolitan area.

Mr. David Kirkaldy's experiments show that two 6-inch cubes of the white and green stones respectively crushed at 546·4 and 438·4 tons per square foot.

It may be seen in the Colonial Institute, Northumberland-avenue; Llandaff Cathedral, Carmarthen Asylum and Gaol, Neath Post Office, All Saints' Church, Torquay; Brecon Church, &c.

New Quay Quarry.—This quarry is near Llandyssil, Cardiganshire, and the general appearance of the stone raised is very similar to that of the lastly-described quarry, with the addition of a little mica. It is found in the Lower Silurian formation. A microscopical examination shows that the stone is derived principally from the disintegration of granitic rocks, the three minerals essentially constituting these latter,—quartz, felspar, and mica,—all being present. This accounts, in some measure, for the very high percentage of alumina in the stone (9·70), though we are inclined to think that some of this chemical has also been introduced from an extraneous source, more especially as we find that the chemical analysis was made on a surface stone, which hardly does the material credit. The proportion of silica (87·25) is, of course, correspondingly low. The stone, however, is very compact,—a quality due to great compression, and this places it in the front rank of the sandstones used for building purposes. Mr. Kirkaldy's experiments show that the resistance to thrusting stress on four 6-in. cubes was 739·2, 729·7, 681·0, and 671·9 tons per square foot.

It has been used principally in the neighbourhood, a fine example being in the new Infirmary at Aberystwyth, whilst it has also been selected for rebuilding the University College of Wales, at the same place.

The *Minera* quarry, Pen-y-gelli, Denbighshire, supplies a greenish-brown stone for ashlar, to Liverpool, Chester, &c.

Sandstones are raised extensively for buildings in *Scotland*, chiefly from beds of old red sandstone and Carboniferous age. Everybody is familiar with the celebrated flags and stones from Dundee and Arbroath, in Forfarshire, as most large cities, especially Edinburgh, Glasgow, and London, have been built and paved with them to some extent. It is the Arbroath stone, however, which forms such excellent inside pavements, the Dundee being used mostly for ashlar and the like. The flagstones from Caithness need no introduction, their durability and strength being well known. The largest quarries are in the vicinity of Thurso.

The following Carboniferous sandstones are most valuable, the buildings in Edinburgh and Glasgow being largely constructed of them.

Craigleith Quarries.—These are situated quite close to Edinburgh, and the whitish-grey stone obtained from them is one of the best, and most durable in the United Kingdom, as everybody admits. The stone is fine-grained, and the quarries show a vertical face of about 240 ft. to 260 ft. All this, however, is not workable stone. The freestone runs in beds from a few inches to 10 ft. or 12 ft. in thickness, and these are often parted by shales. It will be obvious that all the stone cannot be of precisely the same character.

The chemical analysis shows a very high percentage of silica (98·3), and the microscope clearly demonstrates the existence of much of this chemical between the siliceous grains, so that the stone has a tendency to become splintery. Small pieces of mica are present.

It has been largely used in London and examples may be seen in Southwark Bridge. Many public and private buildings in Edinburgh are made of it, amongst which we may mention the Law Courts, Royal Exchange, "National Monument," and the University. It has also been exported to the Continent.

Other Carboniferous sandstone quarries are at *Binnie*, near Uphall, Linlithgowshire, where the stone is light brown or grey, and has been used in the New Club House, Princes-street, Edinburgh, and the Bank at Greenock. *Giffneuch*, near Glasgow, the stone being pale grey, fine-grained, easy to work, and much used in that city and the neighbourhood: its weathering qualities are variable. *Hunter's Hill*, also near Glasgow, and very similar in appearance to that from Giffneuch. *Humbie*, near Edinburgh, where there are three kinds of stone, different shades of grey; the top bed is darkest. It is fine-grained, occasionally micaceous, and yields large blocks, suitable for fine ashlar. It has been used in Dundas Castle, additions to the Royal Institution, Edinburgh, and in the Royal Exchange, Glasgow. There are also numerous quarries to the northward of *Paisley*, near *Dunmore*, Stirlingshire, and near *Perth*.

The Triassic or New Red Sandstone series of Scotland produces some good material. There are several large quarries in the vicinity of Annan, in Dumfriesshire, the most celebrated of which are the

Corsehill Quarries.—The prevailing colour of the stone is a dark red, but some of the beds are bright pink. It is a fine-grained sandstone, the general thickness of the beds being from 12 in. to 30 in., but occasionally up to 4 ft. The stone runs very large so that practically any length and breadth can be obtained. It is easily worked and of uniform texture and appearance. Railway sidings are made into all the quarries, thus enabling the material to be sent away with expedition. A large staff of masons are employed in working the rock.

The particles of the stone appear to be bound together partly by compression and partly by silica and peroxide of iron. The chemical analysis shows silica 95·24, alumina only ·56, peroxide of iron 1·28, carbonate of lime 1·40, carbonate of magnesia 1·23, &c. Its specific gravity is 2·26, and the amount of water it absorbs is 6·25 per cent. The results of experiments to show the resistance to thrusting stress of three 6-in. cubes give 643·0, 513·1, 372·7 tons per square foot, before the stone was crushed.

Corsehill stone is being largely used in many parts of the kingdom for ordinary house-building purposes, bridges, and docks. It has been used in the following edifices:—Liberal Club and Free Library, Belfast; National Picture Gallery, Edinburgh; James Street Station, Liverpool; Hand-in-Hand Insurance Office, Queen Victoria-street; St. James's Hall, Piccadilly, London; and the principal buildings in Annan, including the parish church, built in the seventeenth century. At least 5,000 or 6,000 tons are annually exported to the United States. A large part of the interior of the Capitol Building at Albany and several public edifices in New York have also been constructed with it.

There are several other Triassic sandstone quarries in Dumfriesshire, all of which produce a somewhat similar stone, and greatly contribute to the pleasant appearance of neighbouring towns.

The northern and southern parts of *Ireland* produce good building sandstones, of approximately the same geological age as those we have mentioned in Scotland. The Old Red Sandstone affords fine-grained flagstones and tiles in the counties of Cork and Kerry, and it is in the upper part of this formation that some of the oldest known plants (*Palæopteris Hibernica*) have been obtained. Speaking generally, the sandstones are brown or reddish, and are very durable, some in buildings of high antiquity being in good preservation at the present day. The sandstones of carboniferous age are largely worked. A large portion of Belfast is built of a fine-grained white freestone from Cookstown, the excellence of which is apparent in the larger edifices in that city. There is abundant good material in county Antrim, near Ballycastle, close to the sea; and we must here again point out the lack of energy on the part of those who might develop a large industry in stone in this part of Ireland. Its proximity to the sea, and other natural qualifications, are present to enable the stone to be easily shipped and sent to any port in the kingdom.

The Carlow flags are of a dark-blue and grey colour, rather micaceous, and are sent to Dublin by canal. The upper part of the Trias, although so arenaceous in the western part of Antrim, does not, as a rule, furnish good building stones; but in the lower part they appear to be harder and more durable, whilst the stone is decidedly handsome, as may be seen in Belfast, Newtownards, and the neighbourhood. The prevailing tints are reddish-brown, yellow, and light-grey.

*** With reference to our remarks on the *Park Spring Quarries*, near Farnley, Leeds, p. 862, *ante*, the formation in which they occur is not the Jurassic (though it has been supposed to be so formerly), but the Carboniferous.

Books.

La Nécropole de Myrina: Fouilles exécutées au Nom de l'École Française d'Athènes. Par E. Pottier, S. Reinach, et A. Veyries. Texte et Notices par E. Pottier et S. Reinach. Ernest Thorin, éditeur.

THIS is the first volume of the long-projected work on the excavations at Myrina. Some specimens of the remarkable terra-cottas discovered there,—terra-cottas which threaten to eclipse in interest those of Tanagra,—are, as we noted some months back, exposed in the Campana-room of the Louvre. A few more have been published in the *Bulletin* of the French School at Athens, but now for the first time the whole material, with ample commentary, is laid before the public. Myrina, up to

the date of these excavations, has been to most people nothing but a name. Happily the site of the ancient city (now known as Kalabassary) belonged to a gentleman of rare culture and liberality, M. Aristides-bey Baltazzi, whose name should be handed down in all honour to posterity. He offered to the French Government the privilege of excavating the necropolis known to exist on his property. The French school was not slow to avail itself of the offer. Three skilled archæologists, M. Veyries, M. Pottier, and M. Reinach were sent out to direct the work. M. Veyries died before it was completed. The present book is the result of the investigations of his two collaborators. Their object they define to have been threefold,—(1) to determine the ancient site of Myrina; (2) to explore methodically the whole of the Greek necropolis, and observe carefully the shape of the tombs, the manner of burial, and, if possible, to determine the chronology of the whole; (3) to investigate the specialities of terra-cottas fabricated in Asia Minor and contrast their characteristics with those found in Greece proper.

The third object is one of such general interest that we shortly summarise the results. M. Reinach and M. Pottier, with over six hundred specimens before them, had a task more interesting than difficult. They summarise their conclusions, with that admirable lucidity which characterises French work, under five heads. (1) The Myrina terra-cottas show a number of types of great antiquity, originating, no doubt, in religious tradition and perpetuated long after the skill of the coroplast was equal to more finished work; instances of this are the seated Demeter figures. (2) In general the style of the terra-cottas shows the influence of the so-called "Hellenistic," i.e., Post-Alexandrian, art. Noticeably we have a very small head, elongated limbs, realism in treatment of hair, all of which point back to the influence of Lysippos. (3) The Asia Minor coroplasts had an evident liking for the reproduction of motives popular in statuary, *e.g.*, we have a number of small reproductions of the Aphrodite of Cnidos by Praxiteles, again of an Aphrodite Anadyomene wringing her hair; a crouching Aphrodite, the draped Aphrodite possibly of Cos, usually known as the Venus Genetrix. This tendency adds, of course, greatly to the value and interest of the Myrina find. (4) Besides the general Hellenistic influence the Myrina terra-cottas show the more immediate and distinct action of the schools of Tralles and Rhodes,—especially in their love of complicated groups and sensational gestures. (5) It is noticeable that we have distinct evidence to the effect that coroplasts at Myrina borrowed their motives, nay more, their actual moulds, from their predecessors at Tanagra. Such are the general propositions established; their justice is fully borne out by the examples given in the plates, fifty in the text and fifty full-page heliographs. To these is added an excellent topographical map.

Order from Chaos: a Treatise on Land Tenure. By WILLIAM PILLING. London: Chapman & Hall, Limited. 1886.

IT is as well that on his title-page Mr. Pilling should explain what is the subject of his work, for, certainly, the chief title might refer to geology, or any other science, as much as to land tenure. The book contains,—to put it briefly,—a draft of an Act of Parliament to put our land laws as the author thinks they should be. Most people are agreed that some improvements are needed. The main difficulty is, how we are to carry out the required reforms. Mr. Pilling's draft will not help us much: it is altogether too loose a compilation. For example, as regards county land offices, in his eighth article he begins by saying: "The administration of the law shall in each county be under the supervision of the Lord Lieutenant." It would be curious to see how such a loose rule would work in practice,—as a matter of fact, it may mean anything or nothing.

Proposed Restoration of Dunblane Cathedral.—The *Elgin Courant* reports that at a recent meeting of the heritors of the parish of Dunblane, a handsome offer was made on behalf of one of their number to restore the nave of the cathedral to a place of worship. This offer was made on the condition that the heritors contribute a certain sum to assist in the restoration. It is stated that "40,000*l.* would be required to restore the cathedral effectively."

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

14,363, Ventilators, Shutters, &c. B. Clarke.

This apparatus is chiefly designed for use in opening and closing lights and ventilators as used in greenhouses. The power required is applied in a direct line, and the frames are thus held securely at any angle without the intervention of levers. A threaded spindle passes through a nut, and when the winch-handle actuating the same is revolved the light is lifted or lowered. A swivel-bearing is employed which accommodates itself to the various angles, the rod or spindle always being in a direct line with the frame of the light or ventilator.

186, Flushing Cisterns. O. Elphick.

These improvements relate to that class of apparatus in which the discharge of water from flushing cisterns is effected by means of a syphon put into action by the discharge into it of water from a cylinder contained within the cistern. The syphon is here formed by carrying the discharge-pipe up within the cistern to a level above the top of the tank, and by surrounding this upward prolongation of the discharge-pipe with another pipe of larger diameter but closed at the top, with openings into it at the bottom for the passage of water. A pipe is led from the closed top of the outer syphon-pipe to the bottom of a cylinder contained within the cistern. The cylinder is fitted with a piston coupled to a lever in connexion with the pull-up mechanism of the closet to be flushed. Normally the piston is held up by the lever to the top of the cylinder, and as the cistern fills with water the cylinder can also fill through the openings in its sides just below the piston. When the piston is forced downwards it forces water from the cylinder to the closed top of the outer syphon-pipe, which is then discharged in a direct downward direction into the open mouth of the inner syphon-pipe, starting the syphon and causing the remainder of the water to be sucked up between the inner and outer syphon tubes and discharged through the inner one, which forms the descending limb of the syphon.

215, Window Fasteners. C. Horner.

This is a screw fastener worked by means of a milled head into a socket fixed on the upper sash.

364, Sash-Fasteners. J. T. Hyde.

This is a lock fastener. The improvement consists chiefly in the form of the plate, which is made with a tightening catch for the movable arm of the fastening. When pushed quite home the arm can be locked in position with a key.

1,988, Discharge-Connexions for Baths, &c. John Shanks.

The discharge orifice in the bottom of the vessel is provided with a flanged metal grating, and the mouth of the discharge-pipe below is brought up to it on the underside, and then fastened with a screw. It is claimed that in the case of earthenware baths, &c., this method of fastening is less liable to cause breakage.

11,875, Automatic Flushing Apparatus. J. Tonge.

The improvements which are the subject of this invention are designed to discharge water into the openings or spaces desired to be cleansed at regular periods, which periods may be adjusted as required; this is effected by the use of a double vessel, which is alternately filled and emptied by the flow of water.

12,539, Decoration of Girders. E. C. Allam.

According to this invention, the exposed surfaces of wrought-iron girders are decorated by impressing thereon in the process of rolling a raised pattern, so that they may be used for fascias or friezes in buildings. When, for instance, a shop-front fascia, with a name, has to be introduced, a projection is rolled on the flanges so as to allow for the insertion of a metal panel, or the letters, bronze, cast-iron, brass, &c., may be affixed to the web of the girder.

10,965, Hammers, &c. C. J. Grellner.

This invention consists of improvements in the method of fastening the heads to the handles by means of a wedge in which a nail is driven and deflected by a groove in the wedge in such a manner that it turns outward into the wood of the handle, thus giving an additional security.

11,590, Indicating Locks. E. Banfield.

The object of this invention is to provide a simple, cheap, and reliable means of showing on the outside of an apartment or compartment when the same is engaged. The apparatus consists of a disc, a cover plate, a guide plate with stops, and a crank handle with knob. The disc is attached to the key on the outside of door, and has the word "Engaged," or some other suitable term, upon it. The cover plate is fixed over this, having an opening through which the word on disc is brought to view when in position. The crank handle is attached to the key on the inside of the door, and when the handle is turned to fasten the door, the disc on the outside exhibits the word thereon, and when turned to unfasten the door, the word is hidden by the cover plate. The guide plate with stops is fixed under the crank-handle to keep it in position.

12,950, Shutter Hinges. B. C. Anderson.

This hinge holds the shutters in an open position engaging automatically, and is so formed as to be braced and sustained efficiently against the great force liable to be impressed on it in severe gales. The chief detail is in a peculiarly-formed dog and a pivot for connecting it, so that it may rise or sink to be engaged or disengaged.

13,088, Securing Chimney Pots. E. Marland.

According to this invention, a frame is made of cast iron, about 3 in. in depth, with an angular top, and forming a band or cap around the top of the chimney, which, when fixed, binds the brickwork together, and prevents the bricks or chimney pots from getting loose.

13,182, Soldering Fluid. T. Garton.

This fluid is designed to obviate the formation of "after rust," and is produced by an admixture of several fluid ingredients in specific proportion, notably chloride of zinc and spirits of ammonia.

13,260, Perspective Drawing Apparatus. R. E. Creasey.

By means of this little apparatus it is claimed that the different parts of an object to be drawn in perspective may be reduced to the same scale, and also that the scale may be readily altered. It somewhat resembles in outward form a small winding tape-measure, with a spindle at the top on which gradations are marked, and there is also a sliding nut. A small button at the end of the marked tape or string is held in the mouth while the nut and spindle are adjusted to the object it is desired to draw. When this is accomplished, the scale is found, and the instrument may be applied in the same way to the different parts of the building to be sketched, and the distances set off on paper.

13,021, Fireproof Shutters for Stairways. H. Dale.

This invention relates to the construction of an apparatus designed to prevent the spreading of fire from floor to floor, and consists of a corrugated iron shutter that is housed or boxed beneath the stairs leading to the floor above that in connexion with which the shutter is arranged, the said shutter being so constructed and mounted that it can be readily withdrawn from its housing and drawn to a position to cover the well or opening formed for the stairway.

NEW APPLICATIONS FOR PATENTS.

Nov. 26.—14,414, W. Smith and others, Hinges for Step Ladders.—15,419, J. Hodges, Mortise and Rim Locks.—15,446, C. Steer and J. Stubbs, Norfolk Latches.—15,456, C. Appleby, Heating Chambers or Closets.—15,473, J. Winkler, Press for Moulding Building Blocks.

Nov. 27.—15,493, J. Shanks, Lavatory Basins.

Nov. 29.—15,542, J. Fisher, Latch for Doors, Windows, &c.—15,546, A. Henderson, Syphon Trap Closet Pans.—15,552, H. Lowden, Tiles for Roofing, &c.—15,553, W. Frost, Locks.—15,570, W. White, Flushing Cisterns.

Nov. 30.—15,584, P. Walker, Ventilators.—15,603, F. Baker, Door and Window Fasteners.—15,607, G. & M. Stowe, Bolt for Doors, Windows, &c.—15,609, G. Courtier, Drain Traps.—15,620, S. Timings, Closing Springs for Doors, &c.—15,622, J. Shaw, Cooking Ranges.

Dec. 1.—15,678, H. Sulley, Glazed Pavement Lights.—15,714, W. Pfirsch and B. Kirchner, Process for the Treatment of Wood.—15,729, A. Williams, Portable Dustbin.

Dec. 2.—15,759, R. D. Ridder and W. Bennett, Heating Houses, Public Buildings, &c.—15,769, M. Crofton, Attaching Sash-lines to Frames.—15,779, W. Wrighorst, Bakers' Ovens.

Dec. 3.—15,803, A. Yates, Apparatus for Driving Saw Machinery.—15,815, G. Martin, Holdfasts for Pipes, &c.

Dec. 4.—15,875, J. Coppard, Preventing the Rattling or Jamming of Windows and Doors.—15,904, R. Davison and W. Creed, Wood Block Flooring.

Dec. 6.—15,925, S. Rogers, Fittings to Check the Rattling of Window-sashes.—15,948, H. Haddan, Alarms for Doors.—15,962, S. and S. R. Chatwood, Locks.—15,965, C. Dobbs, Slag Block Paving.

Dec. 7.—15,983, G. Courtier, Kitchen Ranges.—15,988, H. Dunnill and F. Smith, Tiles.—15,998, J Bryant, Alarms for Doors and Windows.—16,007, J. Dedden, Fastening Window-sashes.

Dec. 8.—16,071, W. Meats, Joints for Earthenware Sanitary Pipes.—16,083, W. Sauday, Combined Mitre-cutter, Shoot, and Cramp.

Dec. 9.—16,105, J. Craig, Ventilator.—16,115 W. Matthews and Others, Grabs and Excavators.

PROVISIONAL SPECIFICATIONS ACCEPTED.

12,914, W. Whitehead and A. Emley, Heating Houses, Buildings, &c.—13,159. H. Price, Sanitary Dustbin.—13,431, C. Smith, Slides or Plates for Door-chains.—13,440, J. Parr and T. Kendrick, Sash Fasteners.—13,451, J. Clark, Door Fasteners.—13,555, J. Horrocks, Ventilation of Buildings.—13,647, A. Stove, Automatic Catch or Fastener for Doors, Windows, &c. — 13,692. W. Popplewell, Clamping Devices.—14,010, J. Fenby, Stop Joint or Hinge.—14,015, W. Bagshaw, Plain and Corrugated Sheet-iron Roofs.—14,124, C. Turner, Tubular Springs for Doors.—14,128, P. Walker, Ventilating

Apparatus.—14,223, J. Tall, Concrete Wall Construction.—14,627, H. Dodd, Flushing Apparatus.—14,668, J. Watson, Ventilators.—14,922, J. West, Water-closets.—12,227, J. Goodwin, Window-sash Fastener.—12,336, J. Wood, Ventilator for Windows.—14,126, D. Wilkins, Chimney and Ventilating Shaft Tops.—14,384, S. Robson, Ventilation of Rooms.—14,442, A. Henderson, Fixing Door-knobs to Spindles.—12,463, F. Prouvay, Saws.—13,695, G. Hattersley, Imitation Tiled Surfaces for Hearths, &c.—14,045, W. Granville, Electric Bells and Indicators.—14,054, F. Mori and R. Westley, Paint Brushes.—14,146, W. Bevan, Sash Fastener.—14,168, L. Dove and J. Bush, Sash Fastener.—14,305, H. Wilkes, Window or Sash Fasteners.—14,491, R. Henry, Sash-line Fasteners.—14,692, E. Cowper, Locks, Latches, and Bolts.—15,017, M. Syer, Syphon Water Waste Preventers.—15,024, W. Sudbury and W. Spreadburey, Chimney Tops and Ventilators.—14,386, T. Rees, Metal Tiles.—14,469, H. & A. Foster, Band-saw Frames.—14,470, H. & A. Foster, Sawing Machinery.—14,637, F. Worsner, Fastener for French Windaws.—14,837, H. Bromhead, Skylight or Fanlight Opener.—15,012, H. Macevoy and Others, Portland Cement.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

15,820, E. Pitber, Door-shield or Finger-plate.—883, S. Phillips and S. Wise, Indicator Lock.—1,243, A. Fould and P. Genreau, Refractory Bricks, Tiles, &c.—1,372, J. Watson and H. Moorwood, Dog Grates, Fireplaces, &c.—3,115, G. Kyte, Self-locking and Burglar-proof Coal Plate.—7,726, J. Horrocks, Trapping and Ventilating Water-closets, and Drains connected therewith.—10,829, C. Dobbs, Scoria Paving Blocks.—1,282, J. O'Callaghan, Securing Door Handles or Knobs to Spindles.—7,599, W. Pitt, Traveller Cranes.—1,496, T. Crampton, Electric Bells.—1,654, A. Gold, Hinges.—2,073, G. Lazenby, Kilns.—5,973, J. Grant, Tenoning Apparatus.—13,879, J. Craig, Combined Latches and Locks.—15,235, W. Macrone, Checking the Time of Arrival of Workmen.—1,862, R. Hunter and J. Turnbull, Kitchen Ranges.—1,913, E. Shorland, Chimney and Ventilating Cowls.—5,942, F. Stent, Door Spring.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

DECEMBER 6.

By Salter, Rex, & Co.

Kentish Town—3 and 5, Cathcart-street, 35 years, ground-rent 11*l.*	£440

By Weatherall & Green.

New Cross-road—Nos. 477, 479, and 481, term 40 years, ground-rent 36*l.*	1,295
Ground-rent of 19*l.* a year for 39 years	235
Bloomsbury—64, Marchmont-street, 14 years, ground-rent 13*l.* 13*s.*	300
Bethnal-green—14, Nottingham-street, 32 years, ground-rent 5*l.*	130
Nos. 10, 11, and 12, Waterloo-terrace, 34 years, ground-rent 15*l.*	340

DECEMBER 7.

By A. Richards.

Shoreditch—A fourth share in 5 to 19 (odd), Ebor-street, 14¼ years, ground-rent, 17*l.* 10*s.*	345
Tottenham—2 to 8, and 7 to 12, Union-row, 31 years, ground-rent 24*l.*	210

By Thurgood & Martin.

Piccadilly—38, Great Windmill-street, freehold	1,080
Haverstock-hill—23, Crossland-road, 70 years, ground-rent 8*l.*	500
Chalk Farm—6, Hawley-street, 44 years, ground-rent 5*l.*	350

By Wilkinson & Son.

West Brighton—3, Second-avenue, and 8, Victoria-mews, freehold	5,500

DECEMBER 8.

By Rushworth & Stevens.

Hammersmith—7, Starch-green-road, 55 years, ground-rent 8*l.*	440

By C. A. Richards.

Mottingham—Ground-rents of 74*l.*, reversion in 76 years	1,410

By J. Baker & Son.

Kilburn—6, St. Julian's-road, 78 years, ground-rent 10*l.*	330
Nos. 33, 35 to 41, St. Julian's-road, 78 years, ground-rent 80*l.*	2,385

DECEMBER 9.

By Mullett, Booker, & Co.

Hyde Park—20, Cambridge-square, and stabling, 49 years, ground-rent 31*l.* 10*s.*	3,310

By Newbon & Harding.

Holloway—33, Arthur-road, 56 years, ground-rent 6*l.* 6*s.*	370

By Klenck & Co.

Marylebone—40, Charles-street	165
Battersea—66 and 68, Orbell-street, 91 years, ground-rent 12*l.*	530

By C. C. & T. Moore.

Whitechapel road—No. 48, term 198 years, ground-rent 4*l.*	620
Stratford—24 to 30 (even), Albert-road, 65 years, ground-rent 18*l.*	440
Mile End—6 and 10, Frederick-place, 16 years, ground-rent, 6*l.*	295

By C. & H. White.

Weybridge, Baker-street—Two freehold houses and shops	820

By E. Stimson.

Denmark-hill—Ground-rent 80*l.*, reversion in 69 years	1,900
Walworth—139 and 141, East-street, freehold	£1,400
Ground-rent of 18*l.* a year, term 59 years	240
Kennington—39, Edward-street, 57 years, ground-rent, 4*l.* 10*s.*	410

MEETINGS.

SATURDAY, DECEMBER 18.

Crystal Palace School of Engineering.—Award of Certificates. 1 p.m.

MONDAY, DECEMBER 20.

Royal Institute of British Architects.—Mr. W. Brindley, on "Marble: its Uses as Suggested by the Past." 8 p.m.

Society of Arts (Cantor Lectures).—Mr. Lewis F. Day on "The Principles and Practice of Ornamental Design." IV. 8 p.m.

TUESDAY, DECEMBER 21.

Institution of Civil Engineers.—Professor Alex. B. W. Kennedy, on "The Use and Equipment of Engineering Laboratories." 8 p.m.

Statistical Society.—Mr. L. F. R. Price on "Sliding Scales and other Methods of Wage Arrangements in the North of England." 7·45 p.m.

Miscellanea.

Endowed Schools, Caerleon, Mon.—In answer to advertisements, eighteen sets of designs from various parts of England were submitted for the above, from which the plans of Mr. E. A. Lansdowne, architect, Newport, were selected and unanimously decided upon, subject to consideration of his estimate of the cost of execution.

Draycott Drainage.—The Shardlow Rural Sanitary Authority have instructed Mr. W. H. Radford, Assoc. M. Inst. C.E., sanitary engineer, Nottingham, to prepare a sewerage scheme for the district of Draycott. This hitherto rural village appears likely to increase rapidly in population. A large factory is in course of erection, and new streets are being set out; therefore it is urgently necessary to provide some proper method of sewage disposal for the old and new populations. The surrounding country is very flat, being chiefly meadows on the banks of the river Derwent.

Fires through Lightning in Denmark. The yearly destruction of property in Denmark caused by lightning is very great. Thus it appears from the report recently issued by the insurance companies in Denmark that during the year April, 1885–86, no less than 115 fires were caused by lightning, the damages paid in respect of the same being nearly a quarter of a million sterling. This is due to the almost total absence of lightning conductors on country houses and farms where, in many instances, the roofs are of straw. So serious has this matter become, that some of the insurance companies propose that either a considerable reduction in premium shall be allowed on buildings provided with conductors, or that the companies shall fix them at their own expense. It is calculated that all country dwellings in Denmark might be provided at a cost of about 300,000*l.*

The London Tramway Company's New Depot at Clapham.—The London Tramway Company have just completed a large and commodious new depôt in High-street, Clapham, for the accommodation of the horses and cars engaged in those districts of the company's traffic which are situate between Clapham and Westminster, Blackfriars, the Borough, and Old Kent-road. The depôt has been constructed on a site on the south-east side of High-street, close to the company's Clapham terminus, an old mansion and grounds, occupying an area of between four and five acres, having been purchased by the company for that purpose. Upon the central portion of the site two ranges of stabling have been erected on the north and south sides, stretching eastward to a length of about 400 ft., with a roadway 60 ft. or 70 ft. in width dividing each range of stabling. There are twenty-four stables, each stable having accommodation for twenty horses, or 480 horses in all. The roadway between them forms a spacious carriage-shed, along which four lines of rails have been laid down. The company's cars will be stored in this shed at the close of each day's traffic, there being standing-room for between seventy and eighty cars. The shed is covered in by an ornamental glass roof, supported on light iron principals and girders, the contractors for the roof being Messrs. Morton & Co. Beyond the stables and carriage shed, at the extreme east end of the depôt, a shoeing-forge has been erected, together with veterinary surgeon's offices and apartments, and a number of loose boxes for horses when under medical treatment. At the north-west corner of the depôt, immediately to the left of the entrance from High-street, two blocks of buildings have been erected, one of which contains the manager's and inspector's offices, and the other a mess room for the drivers, conductors, and other servants in the employ of the Company at the depôt. That portion of the site having its frontage to High-street, extending to a depth of between 50 ft. and 60 ft., has been re-sold or leased by the Company for building purposes, and a range of houses and shops is now in course of erection thereon, the entrance to the depôt being in the centre. The works at the depôt have been carried out under the superintendence of the Company's engineer and surveyor and by their own workmen.

The New Roof at the King's Cross Railway Station.—The re-erection of the roof to the western portion of the Great Northern Railway Company's King's Cross Station, now in progress, will extend over a considerable period, but the arrangements are such that the traffic will in no way be interfered with. The massive travelling stage which has been erected contains about 14,000 cubic feet of timber and 240 tons of iron. The lower portion of the stage consists of immense balks of timber, bolted and riveted together, and resting on a series of wheels running on metals. These timbers form the base of the structure, and support four iron girders, each upwards of 100 ft. in span. The working stage has been erected on these girders, and rises in three tiers to a height of between 80 ft. and 90 ft., being carried up to about 12 ft. below the top of the present arched roof, upwards of 100 ft. high, which is to be replaced by a new roof of similar design, but constructed of iron and glass instead of wood and glass. The first section of the work is now being proceeded with. Messrs. A. Handyside & Co., bridge and roof builders, of Derby and London, are the contractors for the works, which are being executed under the superintendence of the company's engineer in-chief. It will be remembered by many of our readers that the roof over the eastern half of the station was reconstructed some years ago. The original roof (of which the western half is now being removed) was remarkable from the fact that the semicircular roof principals were built up of laminæ or layers of boards clamped together. There were no tie-rods. The result was a very light and open roof, which, although it has not fulfilled all the expectations of its designer (Mr. Lewis Cubitt), has yet stood very well, it being now thirty-four years since it was put up. Illustrations of it, showing its construction, were given in the *Builder* for Oct. 2, 1852.

The Action of Water on Metal Pipes.—The interminable question of the action of water on metal pipes has been occupying the attention of Mr. Lory. From investigations made by this gentleman at Grenoble, and quoted in the *Gesundheits-Ingenieur*, it would appear that water containing organic matter in solution attacks iron pipes very speedily. He has made many analyses of water conveyed in iron pipes, and also of water known to have attacked pipes in a manner which led to the formation of what are described as "scabs, or carbuncles of oxide of iron." These scabs have been found to consist mainly of hydrated oxide of iron, and contained 5 to 10 per cent. of organic matter. If from this it may be concluded that the destructive action is due to the presence of organic matter the fact may afford some explanation of the reason why, in some instances, cast-iron pipes resist corrosion, although in other cases, as at Grenoble, they become speedily covered with rust-carbuncles. The manner in which soft water may influence lead pipes has been considered in a report issued by Dr. White, Medical Officer of Health of Sheffield, in which are quoted some experiments conducted at the Hygienic Institute of Pesth. Water, after having passed through a pipe 39 mètres in length, was found to contain from 0·085 to 4·7 milligrams per litre of lead, the latter percentage only occurring after the water had remained in the pipe for one month. These experiments are briefly referred to in the Transactions of the Institution of Civil Engineers, vol. lxxxv., p. 64, where information is sought concerning the protection afforded by covering the pipes internally with a coating of magnetic oxide and the results of any experiments bearing upon this question. In Germany, Switzerland, and other places, galvanised iron piping is used for water conveyance without hesitation, while in Austria this material is forbidden by law.

Sale of a Building Estate at Ilford.—The second portion of the Oaklands Park Estate at Ilford was offered for sale on Monday last, at the Angel Hotel, Ilford, by Messrs. Baker & Sons. The estate is situate about ten minutes' walk from the Ilford Station of the Great Eastern Railway, having its principal frontage to the main high road to Romford, and extending northwards to the boundary of the Great Eastern goods depôt. A new road between 40 ft. and 50 ft. wide, designated Oaklands Park Avenue, has been constructed through the centre of the estate. Upwards of fifty houses and shops have already been erected at the western end of the estate. The number of plots offered on Monday was seventy-five, of which twenty-four were shop plots facing the main high road. There was a very numerous attendance. The auctioneer, in alluding to the advantages possessed by the estate for building purposes, pointed out that in addition to railway communication with the City, the present tramway terminus was only a mile distant, and that very shortly a line of trams would pass the estate. The several plots have frontages of 15 ft. and 17 ft. each, with depths varying from 40 ft. to 60 ft., and at the east end of the estate a plot having a frontage of 57 ft. to the main road, and containing an area of about 6,000 ft., is reserved for the erection of a large hotel. There was a close competition for the several lots submitted, all of which were sold, the plots for the erection of private houses being disposed of at prices ranging from 10*l.* to 15*l.* each, whilst the shop plots facing the main road realised 23*l.* and 26*l.* each.

Gas versus Electric Light.—According to a Vienna journal, the *Electro-Techniker*, a discovery of great importance as regards the future of lighting by gas has recently been made by Dr. Auer, of Vienna, viz., an incandescent gas light said to be as brilliant and pleasant as the electric light and still 50 per cent. cheaper than ordinary gas. It is generally known that when the electric light, through Edison's celebrated discovery, began to be used in earnest, gas engineers did their utmost to introduce improvements into the system of gas-lighting. Among these was the Siemens gas-generating lamp, which is, however, only suitable for the lighting of large rooms, and the hydrogen gas incandescent lamp invented by the Swedish engineer, Herr Fahnehjelm. Dr. Auer's invention is based on the same principle as the latter, viz., to bring a solid incombustible body to white heat. But instead of, as Fahnehjelm, using magnesia needles, Dr. Auer employs a cylinder with perforated sides, the composition of which is kept strictly secret. The gas flame enclosed in the cylinder and over the whole is placed on another gas cylinder. By the heat of the gas flame the incombustible body emits a dazzling white light, which is quite steady, and which is said to excel the electric light in brilliancy. As regards the economical side, Dr. Auer's gas-light consumes only 57 to 75 litres of gas per hour when producing a light equal to between twenty and thirty normal candles, whereas the burners now generally in use consume from 150 to 220 litres per hour in producing a light equal to from eleven to sixteen normal candles. The incombustible cylinder costs very little, and lasts from 600 to 1,000 hours, whilst it may be replaced in a couple of minutes. Gas of inferior quality may also be used, even hydrogen gas, which is four or five times cheaper than coal gas. It seems, therefore, that the Auer incandescent gas-light may become a dangerous rival of the electric light.

PRICES CURRENT OF MATERIALS.

		£.	s.	d.	£.	s.	d.
TIMBER.							
Greenheart, B.G.	ton	6	10	0	7	0	0
Teak, E.I.	load	9	0	0	14	0	0
Sequoia, U.S.	foot cube	0	2	4	0	2	7
Ash, Canada	load	3	0	0	4	10	0
Birch ,,		2	5	0	3	10	0
Elm ,,		3	10	0	4	10	0
Fir, Dantsic, &c.		1	10	0	4	0	0
Oak ,,		2	10	0	4	10	0
Canada		3	0	0	6	0	0
Pine, Canada red		2	0	0	3	10	0
,, yellow		2	5	0	4	0	0
Lath, Dantsic	fathom	3	0	0	5	0	0
St. Petersburg		4	0	0	5	10	0
Wainscot, Riga	log	2	15	0	4	0	0
,, Odessa, crown		3	5	0	3	7	6
Deals, Finland, 2nd and 1st	std.	7	0	0	8	0	0
,, 4th and 3rd	100	6	0	0	6	10	0
Riga		5	10	0	7	0	0
St. Petersburg, 1st yellow		8	10	0	14	0	0
,, 2nd ,,		7	0	0	8	0	0
,, white		7	0	0	10	0	0
Swedish		6	0	0	15	0	0
White Sea		7	0	0	17	10	0
Canada, Pine, 1st		17	0	0	29	0	0
,, ,, 2nd		11	0	0	17	0	0
,, ,, 3rd, &c.		6	0	0	8	0	0
,, Spruce, 1st		8	0	0	11	0	0
,, ,, 3rd and 2nd		5	0	0	7	10	0
New Brunswick, &c.		5	0	0	7	0	0
Battens, all kinds		4	0	0	12	0	0
Flooring Boards, sq. 1 in., Prepared, first		0	9	0	0	13	0
Second		0	7	6	0	8	6
Other qualities		0	5	0	0	7	0
Cedar, Cuba	foot	0	0	3	0	0	3½
Honduras, &c.		0	0	2½	0	0	3½
Australian		0	0	2	0	0	3
Mahogany, Cuba		0	0	4	0	0	7
St. Domingo, cargo average		0	0	4	0	0	7
Mexican ,,		0	0	3½	0	0	4½
Tobasco ,,		0	0	4	0	0	6
Honduras ,,		0	0	4	0	0	6
Maple, Bird's-eye		0	0	6	0	0	8
Rose, Rio	ton	7	0	0	10	0	0
Bahia		6	0	0	10	0	0
Box, Turkey		5	0	0	17	0	0
Satin, St. Domingo	foot	0	0	6	0	0	10
Porto Rico		0	0	7	0	1	0
Walnut, Italian		0	0	4	0	0	5
METALS.							
IRON—Bar, Welsh, in London	ton	4	7	6	4	15	0
,, ,, in Wales		4	2	6	4	7	6
,, Staffordshire, London		5	10	0	6	0	0
Sheets, single, in London		6	15	0	8	10	0
Hoops ,,		6	0	0	7	0	0
Nail-rods ,,		5	15	0	6	10	0
COPPER—							
British, cake and ingot	ton	43	0	0	44	0	0
Best selected		44	0	0	45	0	0
Sheets, strong		51	0	0	52	0	0
Chili, bars		39	0	0	39	10	0
YELLOW METAL	lb.	0	0	4	0	0	4½
LEAD—							
Pig, Spanish	ton	12	15	0	0	0	0
English, common brands		13	0	0	0	0	0
Sheet, English		13	17	6	14	0	0
SPELTER—							
Silesian, special	ton	14	10	0	14	12	6
Ordinary brands		14	7	6	14	10	0
TIN—							
Straits	ton	101	0	0	0	0	0
Australian		101	5	0	0	0	0
English ingots		105	0	0	0	0	0
OILS.							
Linseed	ton	20	0	0	20	5	0
Cocoanut, Cochin		37	10	0	0	0	0
Ceylon		26	10	0	0	0	0
Palm, Lagos		24	0	0	24	10	0
Rapeseed, English pale		22	10	0	0	0	0
,, brown		21	0	0	0	0	0
Cottonseed, refined		18	10	0	19	10	0
Tallow and Oleine		25	0	0	45	0	0
Lubricating, U.S.		6	0	0	10	0	0
,, refined		8	0	0	13	0	0
TURPENTINE—							
American, in casks	cwt.	1	8	0	0	0	0
TAR—							
Stockholm	barrel	0	15	0	0	15	6
Archangel		0	10	6	0	11	0

TENDERS.

ABERCARNE.—For the erection of a Public Hall and offices, at Abercarne, Monmouthshire. Mr. Geo. Rosser, Newport, architect, Mon.:—

Thos. Williams & Son, Newbridge, near Newport, Mon. (accepted)	£1,215 0 0

BERMONDSEY.—For the erection of six houses, and alterations and additions to one house and drying-shed, Paulin and Maltby streets, for Mr. William J. Perrin. Mr. Edward Crosse, architect, Bermondsey-square:—

J. Bullers	£2,070 0 0
J. & J. Greenwood	2,044 0 0
B. Wells	1,964 0 0
Spencer & Co.	1,917 0 0
F. Higgs	1,910 0 0
G. Potton	1,905 14 7
W. & H. Castle	1,844 0 0
W. F. Russell	1,822 0 0
J. Almond	1,800 0 0
A. White & Co.*	1,727 0 0

[Architect's estimate, 1,860*l.* 3s. 7d.]
* Accepted. Tender sent in error, 1,427*l.*

BURGESS HILL (Sussex).—For construction of about 1,700 lineal yards of pipe sewers, and various works in connexion therewith, for the Burgess Hill Local Board:—

Rowland & Son	£999 0 0
W. Langridge	989 0 0
W. Bryant	985 0 0
J. Parsons & Son	911 8 0
J. Longley	896 0 0
J. Harrison	883 0 0
W. Cunliffe, Dorking (accepted)	844 15 0

DARENTH (Kent).—For painting, distempering, and other works, at the Asylum for Imbeciles, Darenth, near Dartford, Kent, for the Managers of the Metropolitan Asylum District, under the superintendence of Messrs. A. & C. Harston, architects, Leadenhall-street. Quantities not supplied:—

W. Wythe, Dalston	£1,771 5 0!
W. Andrews, East Margate	1,323 3 3
H. Fullager, Kingsland	1,168 8 0
G. F. Wenborn, Blackheath	1,097 13 9
T. Wilder, Gravesend	999 0 0
C. Willmott, Hackney	980 0 0
Robson, Snaresbrook	897 0 0
Proctor, Woolwich	790 0 0
Church & Co., Coleman-street	780 0 0
A. Whelch, Dover	780 0 0
A. Gee, Stafford	775 0 0
Lilley, Pall-mall	767 0 0
Dudley, New Southgate	661 15 0
Vigor & Co., Poplar	650 0 0
T. A. Bone, Regent's Park	643 0 0
W. F. Hadlow, Dover (accepted)	609 0 0!

FARNBOROUGH.—For villa residence in Alexander-road, Farnborough, for Mr. H. W. Bolton. Mr. S. Friend, architect, Aldershot:—

A. J. Batchelor	£1,233 0 0
W. Garland	1,175 0 0
W. Hughes	975 0 0
Seabright & Son	870 0 0
E. Kemp, Frimley (accepted)	823 0 0

HAMPSTEAD.—For the construction of brick and pipe sewers, laying down new granite carriageways and York stone footways, and executing other works in connexion therewith, for the purpose of the High-street, &c., Hampstead, Improvement, for the Metropolitan Board of Works. Sir J. Bazalgette, engineer:—

G. Elkington	£10,300 0 0!
Hindle, Morrish, & Co.	9,800 0 0
Church & Co.	8,480 0 0
C. Killingback	7,893 0 0
G. G. Rutty	7,880 0 0
Trehearne & Co.	7,550 0 0
J. Mowlem & Co.	6,980 0 0
Nowell & Robson	6,773 0 0
S. & E. Bentley	6,740 0 0
G. Felton*	5,675 0 0!

* Accepted, subject to inquiries.

HARLOW (Essex). — For building new Wesleyan Chapel, at Burnt Mill, near Harlow. Mr. Charles Bell, architect, Dashwood House, New Broad-street:—

Hunt, Hoddesdon	£400 0 0
Nicholls, Harlow	388 0 0
Burton & Son, Sawbridgeworth	375 0 0
W. Cornwell, Bishops Stortford*	365 0 0

* Accepted.

ILKESTON.—For one pair of villa residences, for Mr. Charles Woollercroft. Mr. George Haslam, architect, Ilkeston:—

W. Haynes, Ilkeston	£1,436 17 0
J. H. Nicklin, Ilkeston	1,416 0 0
F. Shaw, Ilkeston	1,325 0 0
R. F. Brown, Stanley-common*	1,320 0 0

* Accepted.

ISLINGTON.—For alterations to the Milford Haven public-house, Caledonian-road, for Mr. H. Gerlach. Mr. R. A. Lewcock, architect:—

J. Walker (accepted)	£360 0 0

KENSINGTON.—For completing Nos. 73, 75, 77, 79, 81, 83, 89, 91, 93, and 98, Comeragh-road, West Kensington, W., for Messrs. Hoare & Co. Messrs. Rogers, Chapman, & Thomas, surveyors, Belgrave-road, S.W.:—

Martin	£3,128 0 0
Hook	3,047 13 0
Aldin & Plater	2,985 0 0
Ashfold	2,984 7 8
Prestige & Co.	2,939 0 0
G. T. Smith & Son	2,839 0 0
Lorden & Son	2,789 0 0
Henry Smith & Son (accepted)	2,787 0 0

LONDON.—For alterations and additions to premises, No. 57, Carey-street, Lincoln's Inn, for Mr John Clayton. Mr. R. Owen Allsop, architect, Norfolk-street, Strand:—

F. Love	£445 0 0
Sykes & Son	436 0 0
W. Laughton	430 0 0
Higgs & Hill	388 0 0
W. & F. Croaker*	384 0 0

* Accepted, subject to alterations.

CONTRACTS.

Epitome of Advertisements in this Number.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page
Broken Granite and Flints	Southend Local Board	F. H. Tulloch	Dec. 21st	i.
Stores and Materials	Nottingham Corporation	A. Brown	Dec. 23rd	ii.
Works and Materials	St. Martin-in-the-fields Vestry	H. Jacques	do.	ii.
Outfall Sewerage, &c., Works	Barnet R. S. A.	W. H. Mansbridge	Dec. 29th	ii.
Enlargement of Sorting Office, Bow, E.	Com. of H.M. Works	*Official*	Dec. 31st	i.
Cast and Wrought Iron for Bridge	Sheffield Corporation	Robt. Davidson	do.	ii.
Earthenware Sewer-Pipes, &c.	Belfast Town Council	J. C. Breland	Jan. 4th	ii.
Stores and Materials	Liverpool Corporation	*Official*	Jan. 7th	ii.
New School, Abertillery	Aberystruth School Bd.	W. D. Blessley	Jan. 8th	ii.
Pipe-Laying, &c.	St. Helen's Corporatn	D. M. F. Gaskin	Jan. 11th	ii.
Steel Superstructure for Viaduct	Great Western Ry. Co.	*Official*	do.	ii.
Opening out Tunnel, &c.	do.		do.	ii.
Reconstruction of Workhouse	Lambeth Guardians	T. W. Aldwinckle	Jan. 12th	xiii.
Engine Shed, Newhaven Harbour	L. B. and S. C. Ry. Co.	F. D. Banister	Jan. 17th	xiii.
Granite Carriageways, Pipe-Sewers, &c.	Met. Board of Works	*Official*	Jan. 21st	ii.
Completion of Ten Houses, Forest Gate	.....	James F. Wesley	Not stated	ii.

LONDON.—For new buildings, at the corner of Oxford-street and Wardour-street, for the Oxford-street Land Investment Company, Limited. Messrs. H. H. Collins & Banister Fletcher, architects:—

Neave & Neave	£25,080	0	0
S. T. Bird	24,990	0	0
Perry & Co.	24,910	0	0
Boyce	24,880	0	0
Bywaters	24,860	0	0
Nightingale	24,650	0	0
Oldrey	23,977	0	0
J. O. Richardson	23,540	0	0
J. Mowlem & Co.	23,383	0	0
Mark	23,280	0	0
Brade	23,000	0	0
Greenwood	22,918	0	0
Ashby & Horner	22,818	0	0
Croaker	22,720	0	0
Lascelles & Co.	22,600	0	0
Killy	22,418	0	0
Peto Bros.	23,332	0	0
J. Morter	22,200	0	0
Downs	21,937	0	0
Lawrence & Son	21,930	0	0
Brown & Co.	21,350	0	0
Ward & Lambie	21,069	0	0
Kirk & Randall	20,680	0	0
Jackson & Todd	20,300	0	0

LONDON.—For alterations to the Dreghorn Castle public-house, Haverstock-hill, for Mr. Thos. Goddard:—

J. Walker (accepted)	£350	0	0

LONDON.—For the erection of the Yorkshire Grey Hotel, corner of Beer-lane and Lower Thames-street. Mr. W. Seckham Witherington, architect, Mark-lane:—

W. L. Kellaway	£6,300	0	0
J. Martin, Eastbourne	6,225	0	0
W. Oldrey & Co.	5,597	0	0
F. R. Turtle	5,506	0	0
W. Goodman	5,493	0	0
J. Grover & Son	5,488	0	0
Staines & Son	5,480	0	0
G. Parker	5,450	0	0
H. Pickersgill	5,447	0	0
W. Downs	5,425	0	0
F. Higgs	5,400	0	0
J. Allen & Son	5,330	0	0
H. Harbrow & Co.	5,310	17	0
Prestige & Co.	5,275	0	0
W. H. Lascelles & Co.	5,234	0	0
G. & J. Green	5,195	0	0
C. F. Kearley	5,177	0	0
E. C. Howell & Son	5,100	0	0
G. Roberts	5,050	0	0
J. M. Goodwin	4,850	0	0
Church & Co.	4,675	0	0
W. & F. Croaker	4,630	0	0
E. A. Roome	4,630	0	0
G. Stephenson	4,629	0	0
T. Elkington	4,650	0	0
J. O. Richardson	4,629	0	0
W. Shepherd	4,600	0	0
Spencer & Co.	4,575	0	0
W. Buckeridge	4,567	0	0
T. Knight, Sidcup	4,563	0	0
S. Sabey & Son	4,500	0	0
R. Priestley	4,270	0	0
Patman & Fotheringham (accepted).	4,253	0	0

[Architect's estimate, 4,340*l.*]

LONDON.—For sanitary works at the Kennel Club, No. 6, Cleveland-row, S.W. Mr. R. Groom, architect, Queen Victoria-street:—

Wontner Smith & Son	£187	0	0
Goodwin	179	10	0
Buckeridge, 6, Leinster-street, W.*	116	0	0

* Accepted.

NEWHAVEN.—For the carrying out of a new drainage system for the town of Newhaven, Sussex. Mr. W. H. Radford, A.M.I.C.E., Nottingham, engineer:—

Small & Sons, Handsworth, Birmingham	£8,631	0	0
R. Cowdery, Newent, Gloucestershire	8,239	13	9
J. W. & J. Neave, Leytonstone	8,285	0	0
J. Longley, Crawley, Brighton	7,960	0	0
J. Dickson, St. Albans, Herts	7,791	3	4
Capper & Co., St. Albans, Herts	7,250	0	0
J. T. Whettam, Weymouth	7,163	0	0
Meats Bros., Nottingham	6,690	0	0
J. Harrison, Brighton	6,500	0	0
W. Cuncliffe, Dorking	6,117	0	0
J. M. Goodwin, Kilburn	5,985	0	0
J. Edmondson, Edmonton	5,848	0	0
J. Hayward, Eastbourne	5,497	0	0

SOUTHAMPTON.—For the enlargement of Schooling Girls' School, for the St Mary Extra School Board. Mr. W. H. Mitchell, architect:—

Honeychurch & Mitchelmore	£598	0	0
Kimber & Cotton	580	6	5
Stevens & Sons	580	0	0
Franklin	570	0	0
R. Martin	551	0	0
J. Crook	549	10	0
J. W. Rowland	530	0	0
T. J. Jukes	525	0	0
Dyer & Sons	525	0	0
J. With	523	5	0
W. Harvey	510	0	0
Hinton	487	0	0
H. Carden (accepted)	462	10	0

TUNBRIDGE WELLS.—For private improvement works, in Tunnel-road, &c., for the Local Board. Mr. Wm. Brentnall, C.E., surveyor:—

Iles, Wimbledon	£1,333	15	3
Streeter, Croydon	1,067	16	11
Wallis, Maidstone	1,027	19	10
Cattell, Lowestoft	1,026	11	10
W. Cuncliffe, Dorking (accepted)	997	1	5
Heatherley, Covestry	958	15	7
Marshall, Brighton	843	7	10

Roadmaking, &c., Sidcup.—Mr. Henry Owen, of Sevenoaks, writes to say that his tender of 385*l.* in this competition included fencing, and that he did not give a tender for pond. We inserted the list as it was sent to us.

Stabling, Portland Mews.—List received, though without sender's name. Lists cannot be inserted unless vouched for by the sender.

SPECIAL NOTICE FOR NEXT WEEK.—As we publish a day earlier than usual next week, Lists of Tenders for insertion in our next must reach us *not later than* 4 *p.m.* on WEDNESDAY, December 22.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, "THE BUILDER, LONDON."

CHRISTMAS WEEK.—"THE BUILDER" for the Week ending DECEMBER 25th, will be issued on THURSDAY, the 23rd. Advertisements for insertion in that issue must therefore reach the Office before THREE p.m. on WEDNESDAY, the 22nd. Alterations in Standing Advertisements, or ORDERS TO DISCONTINUE the same, must be at the Office by TEN o'clock on TUESDAY Morning.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under ..... 4s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

Terms for Series of Trade Advertisements, also for special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under ..... 2s. 6d.
Each additional line (about ten words) ..... 0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps must not be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to

DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

The "NEW YEAR'S NUMBER" will be published on FRIDAY, the 31st inst. Price 4*d.* Advertisements for this special issue should be sent to the Office as early as possible.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office*, 46, Catherine-street, Covent Garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19*s.* per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26*s.* per annum. To India, China, Ceylon, &c. 30*s.* per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

AN EDITION Printed on THIN PAPER, for FOREIGN CIRCULATION, is issued every week.

TO CORRESPONDENTS.

Registered Telegraphic Address, "THE BUILDER, LONDON."

J. R. B.—F. W. & Co.—G. V. Bros.—A. C. H.—"Lead" (probably these are cases in which directors have special knowledge of the applicants. We should not publish a letter containing an insinuation like that which yours contains, unless we had strong reason to think it was called for).—J. H. (thanks).—V. S.—E. A. L.—G. R.—C. C. M.—D. McK.—C. A. (next week).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

Colonial and Foreign Postage.—An EDITION of "THE BUILDER" printed on thin paper, for foreign circulation, is issued every week.

Best Bath Stone.

CORSHAM DOWN, FARLEIGH DOWN, } SUMMER DRIED.

BOX GROUND. COMBE DOWN. WESTWOOD GROUND.

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